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THE LITTORAL ZONE BENTHIC MACROINVERTEBRATE COMMUNITIES OF 14 SMALL HEADWATER LAKES IN SOUTH-CENTRAL ONTARIO: A SUMMARY OF THE FIRST TWO YEARS

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THE LITTORAL ZONE BENTHIC MACROINVERTEBRATE COMMUNITIES OF 14 SMALL HEADWATER LAKES IN SOUTH-CENTRAL ONTARIO:

A SUMMARY OF THE FIRST TWO YEARS

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EXECUTIVE SUMMARY

The Aquatic Science Section of the Ontario Ministry of Environment and Energy (MOEE) conducts a programme to assess long-term changes in the composition of shallow-water benthic invertebrate communities in small, headwater lakes in south-central Ontario. A number of studies suggest that the benthic communities of the littoral zones of lakes should be monitored as early warning indicators of impending changes in ecosystem health. In this report, we summarize the results of the 1989 fall survey. We also compare the 1989 data with results from 1988. Our sampling protocol involves a 10-minute kick-and-sweep technique to collect benthos at each of 5 sites in the nearshore area of 14 lakes. Herein, we provide maps of the study lakes, descriptions of the sampling sites and an inventory of the fish species present in each lake. Water chemistry data based on ice-free seasonal means are included. We also describe the local geological characteristics, climate and predominant vegetation types.

The fall 1989 survey yielded an average of 79 genera per lake (range: 54 to 98) based on an average of 4636 animals (range: 1237 to 8728). Seventy-one genera were found in only one lake, whereas 11 genera were found in all 14 lakes. The Shannon-Wiener diversity indices calculated at the genus level of taxonomic resolution ranged from 1.08 to 1.432, with a mean of 1.297.

Multivariate patterns in the benthic community were summarized with a correspondence analysis (CA) of the data at the genus level of taxonomic resolution. Forty per cent of the total variation was summarized by the first two axes (using the log abundance data). The majority of the lakes

formed a central cluster with three or four lakes lying on the periphery. A similar pattern was evident from a CA of the presence-absence data suggesting that differences in species composition predominated, rather than differences in relative abundances.

The water chemistry data yielded the following ranges: alkalinity -1.8 ueq·L^{-1} to 98.9 ueq·L^{-1}; pH 5.37 to 6.33; total phosphorus 3.5 to 10.5 ug·L^{-1}; conductivity 19.3 to 38.2 uS·cm^{-1}; and aluminum 5 to 177 ug·L^{-1}. Since the observed pH of some lakes was below 6.0, we anticipate that the littoral benthic communities of some of these lakes have probably been impacted by acid deposition.

A comparison of the fall 1988 and the fall 1989 data revealed that the rank order of the number of genera, total abundance and the Shannon-Wiener diversity index changed between years. Similarly, the multivariate patterns based on CAs of the abundance and presence-absence data also changed. The cause of these changes is not apparent; however, some of the variation may be due to unmeasured variability in the field (e.g., returning to the same site in successive years), as well as sample processing in the laboratory (i.e., sample sorting). The analysis of additional years of data will help to quantify the magnitude of normal year-to-year variation. A short-term QA/QC study has also been initiated to quantify this type of variability in the programme.

The univariate and multivariate biological metrics were correlated with the 18 water chemistry and 4 lake morphology variables. Of the water chemistry variables, pH-related and nutrient-related variables were significantly correlated with various biological metrics. By contrast, lake morphology was only weakly correlated with the biological variables. A comparison between

the same set of correlations for the 1988 and 1989 data revealed very little consistency. Whether or not these differences are due to changes in the benthic communities will be established through similar comparisons over subseqent years. Despite this uncertainty several biological metrics show promise for monitoring changes in littoral macroinvertebrate communities.

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INTRODUCTION

In 1988, the Ontario Ministry of the Environment (now called the Ontario Ministry of Environment and Energy, MOEE) initiated a biomonitoring programme to assess long-term trends in the composition of benthic invertebrate communities in small, softwater Precambrian Shield lakes. This study represents the central-Ontario component of the federal-provincial Long Range Transport of Airborne Pollutants (LRTAP) programme that includes an assessment of anticipated regional changes in the health of inland aquatic ecosystems associated with reductions in sulphur emissions (Shaw et al. 1992). A standard set of survey protocols is currently used by members of the LRTAP programme to permit comparisons among data sets collected from 6 areas in eastern Canada (Appendix 1). Our goals are: (1) to estimate common species distributions; (2) to compare relative abundances among lakes and among regions; and (3), to detect year-to-year changes in benthic invertebrate abundances associated with anticipated improvements in water quality due to emission controls.

This report describes the fall 1989 synoptic survey of the littoral benthic macroinvertebrates in 14 lakes. Herein, we also describe the physical, chemical, and geological attributes, as well as the fish communities of the 14 lakes. In addition, the 1989 data are compared with results from the fall 1988 survey.

STUDY LOCATION

All 14 study lakes are located in south-central Ontario in the county of Haliburton or in the Districts of Nipissing, Muskoka or Parry Sound. The nearest major urban centres are Peterborough (120 km) and Toronto (200 km) to the south and North Bay (130 km) and Sudbury (200 km) to the north (Figure 1). The lakes are scattered over an area that spans 78°35' to 79°52' in longitude and 45°05' to 45°42' in latitude (Table 1).

Climate and Vegetation

The range in average annual precipitation is 90-110 cm in the Dorset area (30-year record). A total of 240-300 cm of snow falls each year, generally between December 1 and April 10. January temperatures average -10°C while in July, temperatures average 17.5°C. Mean annual temperature is about 5°C. Lakes are generally ice-covered from the first week of December to mid-April.

The study area is situated in the Great Lakes - St. Lawrence forest, a region characterized by eastern white pine (*Pinus strobus*), red pine (*Pinus resinosa*), eastern hemlock (*Tsuga canadensis*) and yellow birch (*Betula alleghaniensis*). Other common species include beech (*Fagus grandifolia*), white oak (*Quercus alba*), sugar maple (*Acer saccharum*), basswood (*Tilia americana*), eastern white cedar (*Thuja occidentalis*), red maple (*Acer rubrum*), red oak (*Quercus rubra*), white birch (*Betula papyrifera*) and trembling aspen (*Populus tremuloides*).

Generally, forest stands on the north-facing slopes are coniferous, whereas south-facing slopes are characterized by deciduous trees. Coniferous trees are also common along the shore of each lake.

Geology

The study lakes are situated on the Canadian Shield, an expanse of Precambrian bedrock. The last period of mountain building of the Precambrian period was the Grenville orogeny which formed the Grenville province, a roughly rectangular strip of land 400 km wide and 2000 km long stretching from Georgian Bay to Labrador. The bedrock of the Grenville province is granitic in composition, usually including granitic gneisses and migmatites with marble, quartzite, amphibolite and various igneous intrusives (pegmatites, diorites and metabasics) of less importance (Jeffries and Snyder 1983). During the Pleistocene period, four glacial advances, including the most recent or Wisconsin glaciation, have rounded and polished the rock outcrops of the Grenville province. These glacial advances lowered the relief, scoured many river and lake basins and redeposited glacial debris, including moraines, eskers, outwash sands, gravel and lake sediments. Minor till plains (i.e., continuous moraine deposits >1 m thick) and thin till deposits (i.e., <1 m thick) interrupted by rock ridges are the dominant surficial deposits. Several of the study lakes were submerged beneath glacial Lake Algonquin (about 10,000 years ago) and received sediment-laden glacial meltwater (Girard et al. 1985, Girard and Reid 1990, Reid and Snyder 1986, Appendix 2).

METHODS

Lake and Site Selection

Twelve lakes were originally selected from the MOEE lake chemistry database to span a range of alkalinity from <0 $\mu eq \cdot L^{-1}$ to approximately 100 $\mu eq \cdot L^{-1}$. In 1989 two sensitive, low alkalinity lakes were added: Heney and Pearceley lakes (Appendix 3). All 14 lakes lie within the area bounded by Parry Sound, Gravenhurst and Algonquin Provincial Park (Figure 1). Seven study lakes are located in the historic Lake Algonquin basin, formed after the Wisconsin glaciation (i.e., Blue Chalk, Crosson, Hamer, Harp, Heney, Skidway and Young lakes). The other 7 lie in the Algonquin/Haliburton Highlands (>340 m above sea level; i.e., Clear, Cradle, Delano, Pearceley, Pincher, Plastic, Westward lakes). All of the lakes are small headwater lakes (18 ha to 106 ha; see Appendix 2) that are located in an area of south-central Ontario where sulphate deposition is high (0.75 - 1.25 $g \cdot m^{-2} \cdot yr^{-1}$; Neary and Dillon 1988).

In an initial survey, the field crew circumnavigated each lake and recorded the relative frequencies of various substrate types between the shore and a depth of approximately 1 m. Five sites were then selected to include the predominant substrates; typically bedrock (BDR) and boulders (BOU), cobble (COB), pebble (PEB), silt (SLT) and/or coarse sand (CSD) with macrophytes, plus highly organic detritus and woody debris (LOS). The sites were chosen and sampled in the spring of 1988 (Reid et al. 1994a). They were re-sampled in the fall of 1988 (Reid et al. 1994b) and again, in the fall of 1989. As noted above, Pearceley and Heney lakes were only sampled in the fall of 1989.

Sampling Procedures

Benthos Collections - Field Methods

Our sampling protocols follow the LRTAP approach (Reid et al. 1994a; and see Appendix 1). Benthic invertebrates were collected for 10 minutes at each site along a varying number of transects (0-1 m depth) running perpendicular to shore. The transects were roughly 5 m apart. On each transect the collector waded out to a depth of 1 m with a standard D-frame, 250 μm mesh net. The substrate was gently kicked to disturb and dislodge the surface sediment and associated detritus. The disturbed material was swept up with the net and transferred to a plastic bucket as the collector waded slowly towards the shore. This approach was repeated along a number of transects until a total of 10 minutes had passed. With this sampling protocol, benthic invertebrate abundance is estimated as the number of animals per unit of time (i.e., 10 minutes of effort) rather than per unit of area (e.g., per m^2). The plastic buckets for each site were labelled and then returned to the laboratory where they were refrigerated.

Benthos Collections - Laboratory Processing

The samples were sieved through 6250 and 1000 μm mesh to separate the coarse detritus and large invertebrates from the finer material. The >1000 μm fraction and any invertebrates retained by the 6250 μm mesh were separately preserved in 70% ethanol. After several weeks the sieved fraction (i.e., >1000 μm fraction) was stained to assist in removing the remaining macroinvertebrates from the debris (i.e., using a mixture of 10 g of Eosin B and 10 g Biebrich

Scarlet in one litre of water at the rate of 20 mL of the resultant dye solution per 1 litre of sample). The samples were stained for two days, washed, and then sorted without sub-sampling to remove the remaining animals. The resultant samples of benthic invertebrates were identified to the lowest practical taxonomic level. In most instances, the taxonomic resolution was to the species level. Bohdan Bilyj (of Biotax, Rexdale, ON) identified all of the invertebrates (Appendix 8). No lab changes were implemented in the fall of 1989 relative to the 1988 procedures.

Data Analysis

A series of univariate and multivariate metrics were calculated to summarize the benthic data from each lake. The univariate metrics included the number of taxa, the number of individuals and the Shannon-Wiener diversity index (H') which examines how evenly the individuals are distributed among the taxa. When tabulating the data we also identified rare species unique to single lakes as well as ubiquitous taxa found in all of the lakes.

The Shannon-Wiener index (H′) was calculated using data at the generic level of taxonomic resolution (i.e., species were grouped to the genus level). The H′ index was computed using the following formula:

$$H' = -\sum(n_i / N) \log (n_i / N)$$

where $\mathbf{n}_i$ is the number of individuals in genus **i** and **N** is the total number of individuals. A high diversity index means that relatively similar numbers of individuals belonged to each genus. A low value implies that a large number (or proportion) of individuals were collected from only a few genera. Low diversity is generally assumed to indicate a stressed community that is dominated by relatively few taxa, whereas a high diversity is characteristic of a "healthy" community. Here we used base ten logarithms to calculate diversity. Values can be multiplied by 3.322 or 2.303 to convert to base 2 or natural logarithms, respectively (Zar 1984, p. 33).

Because the H' diversity index has no standard upper bound we also used Evenness (J') which is a standardized diversity index that ranges from 0 to 1. Evenness was calculated using the following formula:

$$J' = H'/\log(S)$$

where S is the total number of genera in the sample. A value of 1.0 implies that each genus has an equal number of individuals, whereas values approaching 0.0 indicate that most of the individuals were from only a few genera.

Two pairs of multivariate metrics were also calculated. Separate lakes-by-taxa matrices of relative abundances (i.e., $\log[X+1]$) and presence-absence were ordinated with correspondence analysis (CA) to summarize the dominant multivariate patterns in the composition of the benthic community. Lakes with similar sets of taxa, or similar composition should cluster together along the first or second CA axes. Plots of the lakes on the first two CA axes were examined to determine whether clusters of lakes were apparent. The ordinations of the 1989 data were also compared to those for the 1988 fall survey to determine whether the results were consistent over the years.

The total number of individuals (i.e., the total count) of each major taxonomic group was also examined to quantify the magnitude of spatial and temporal variability. Spatial variation was defined as the difference in the counts from each of the 5 sites within a lake (i.e., presumably within-lake habitat variation). By contrast, temporal variation was defined as the difference between the 1988 and 1989 counts. For each major taxonomic group in each lake, we calculated a two-way analysis of variance (ANOVA, SAS Institute Inc. 1988) to estimate the sum of squares (i.e., a measure in ANOVA that is analogous to the variance) attributable to these spatial and temporal factors. The sum of squares associated with each of these factors was expressed as a percentage of the total variance in the counts of a given taxon in a particular lake. This standardized measure was used to estimate the relative importance of habitat and year-to-year influences on the collections from each lake. This approach is similar to the calculation of variance components (e.g., see Reid et al. 1995), although it fails to correctly adjust the sums of squares for different levels within each factor (i.e., 5 sites versus 2 times). Because these levels do not change throughout this study any biases are incorporated equally throughout the analysis. We used this ANOVA approximation instead of variance components because the ANOVA avoids the problems of negative values in variance-components estimates that arise when the variance for a given factor approaches zero.

Initially separate ANOVAs were calculated using both raw and log (X+1) transformed data. Both sets of results were compared to verify that the assumptions of the ANOVA were not violated. If these results were similar then we assumed that the ANOVA assumptions were met; however, if the results differed markedly, we assumed that the assumptions were violated and that the results based on the log-transformed data were more robust. Although the two analyses generally produced similar results, several cases suggested that the log-transformed results were more reliable. As a result, we provide the sums of squares from the ANOVAs using only the log-transformed data (see Appendix 7).

The spatial and temporal sums of squares were plotted separately for each major taxonomic group to compare the lakes. On the plots for each taxon we added a 1:1 line as a reference to indicate where all of the variation explained by the ANOVA model is attributed to spatial variation. Lakes lying near the 1:1 line for a given taxon indicate that there were large differences in abundance from one site to the next. This result indicates that the abundances of that taxon were influenced by differences in habitat (or substrate) characteristics among the 5 sites for a given lake. Taxa with abundances that exhibit predominantly spatial variation (i.e., large within-lake variability) may not prove to be useful indicators unless site-specific habitat characteristics are taken into account (e.g., by comparing the abundances for only sandy sites).

We also added a 1:2 line to highlight the area in the plots where spatial and temporal variation each account for an equal proportion of the total variation explained by the ANOVA model. Lakes lying near this 1:2 line indicate that the abundance of a particular taxon is affected by both spatial and temporal factors equally. Lakes lying near the X axis indicate taxa with abundances that differ predominantly between samples collected in the fall of 1988 and the fall of 1989. The abundances of a taxon exhibiting a large amount of temporal variation are not likely correlated with a particular habitat type. As a result, these taxa may prove to be useful indicators of anticipated changes in water quality (for further examples see Reid et al. 1995).

In addition, the sums of squares for the major taxonomic groups in each lake were correlated with those for the other lakes. The resultant lake-by-lake, Spearman rank correlation matrices will exhibit large positive correlations between lakes with similar rankings of the sums of squares for the 24 taxa.

Lastly, the various univariate and multivariate metrics were correlated with lake physical and chemical characteristics to determine whether trends across the lakes based on the biological data could be attributed to variation in lake morphology or water chemistry. Both Pearson and Spearman rank correlations were calculated and compared to determine whether the relationships were linear or influenced by outliers. Because of the small number of observations (i.e., 12 lakes in 1988 and 14 in 1989), interpretation of the results focused on the rank correlations which tend to be more robust with small sample sizes.

The correlation analysis was repeated for the 1988 data to establish whether the results were consistent across the two years. Correlations that were significant at $P<0.05$ were used to identify environmental factors that may contribute to the observed trends in the various biological metrics.

Water Chemistry

The 14 lakes were sampled monthly on average, during the 7-month ice-free season of 1989. Sampling methods followed standard MOEE protocols (Scheider et al. 1983). While anchored over the deepest spot in the lake, a total volume of approximately 3 L was collected with a peristaltic pump (Masterflex Portable Sampling Pump, Model 7570) using 1/2 inch i.d. PVC tubing (Tygon R3603). Aliquots of water proportional to the volume of each 2-m stratum were added to a carboy such that a single, volume-weighted, composite sample was obtained for each of the epilimnion, metalimnion and hypolimnion. Where no distinct temperature gradients existed, water from all depths was pooled to give a single volume-weighted sample for the whole lake.

Coarse particulates in the water were removed by filtering the water through a 80 μm mesh screen positioned at the mouth of the carboy. Sub-samples of the water were poured into the appropriate bottles for subsequent chemical analysis. The chemical parameters include: alkalinity (i.e., a measure of the Acid Neutralizing Capacity, or ANC; e.g., total inflection-point alkalinity), aluminum (Al), calcium (Ca), chloride (Cl), conductivity, dissolved organic carbon (DOC), dissolved inorganic carbon (DIC), iron (Fe), potassium (K), magnesium (Mg), sodium (Na), nitrogen (several forms: NH_4, NO_3 and TKN), total phosphorus (TP), pH and sulphate (SO_4).

Fish Inventory Methods

The Ontario Ministry of Natural Resources (MNR) conducted lake surveys to inventory the fish species in the study lakes. Various types of gear were used in order to sample a range of habitats (e.g., see Dodge et al. 1987). This equipment included experimental gill nets of various mesh sizes, 4 and 5 foot trapnets, Windermere traps and standard minnow traps. Seines were also used in nearshore areas over suitable substrates. All fish were identified to species and the data were recorded as simple presence or absence.

RESULTS AND DISCUSSION

Lake and Site Descriptions

The 14 lakes are all small (18-106 ha) headwater lakes in 5 tertiary watersheds in south-central Ontario (Table 1 and Figure 1). These watersheds are:

1. 2EA ..... lakes in this watershed flow through the Distress River and Upper Magnetewan River and then into Georgian Bay and Lake Huron (i.e., Pearceley Lake);
2. 2EB ..... lakes flow into the Moon River or the Go-Home River then into Georgian Bay and Lake Huron (i.e., Harp, Westward, Skidway, Young, Hamer, Heney and Pincher lakes);
3. 2EC ..... lakes flow into the Severn River then into Georgian Bay and Lake Huron (i.e., Crosson and Blue Chalk lakes);
4. 2HF ..... lakes flow into the Trent System from the Gull River and then to Lake Ontario (i.e., Clear and Plastic lakes);

5. 2KD ..... lakes flow into the St. Lawrence River drainage basin via the Ottawa River and the Upper Madawaska River (i.e., Cradle and Delano lakes).

The shoreline and nearshore substrate survey identified the predominate substrates in each lake (Appendix 2). Of the 70 sites in the 14 lakes, 19 sites are detritus dominated; 9 are detritus and coarse sand; 10 are sand and cobble; and 7 sites are dominated by a detritus and cobble combination. The remaining 25 sites have unique combinations of substrate types (see Table 2).

Chemistry

The water chemistry confirmed the softwater nature of the lakes (i.e., conductivity ranged from 19.7 [Pearceley] to 35 $\mu\mathrm{S\cdot cm^{-1}}$ [Harp]; Table 3) with a range of DOC from low (i.e., 1.5 $\mathrm{mg\cdot L^{-1}}$: Cradle Lake) to moderately coloured (9.6 $\mathrm{mg\cdot L^{-1}}$: Hamer Lake). The lakes also ranged from extremely sensitive to acidification (with alkalinity or ANC < -2 $\mu\mathrm{eq\cdot L^{-1}}$: Pearceley) to moderately sensitive (ANC > 100 $\mu\mathrm{eq\cdot L^{-1}}$: Young). The pH ranged from 5.07 (Hamer) to 6.63 (Blue Chalk). Total phosphorus and total Kjeldahl nitrogen (i.e., TKN) ranged from 3.5 (Clear) to 10.5 $\mu\mathrm{g\cdot L^{-1}}$ (Hamer) and 144 (Clear) to 453 $\mu\mathrm{g\cdot L^{-1}}$ (Hamer), respectively. The nutrient data (total phosphorus and nitrogen) indicate that 13 of the lakes are oligotrophic (i.e., TP < 10 $\mu\mathrm{g\cdot L^{-1}}$; Dillon and Rigler 1975), whereas only Hamer is a mesotrophic lake with a total phosphorus concentration greater than 10 $\mu\mathrm{eq\cdot L^{-1}}$. Table 3 lists additional water chemistry data for the 14 lakes.

Fish Inventory

The MNR survey collected 27 fish species from 10 families in the 14 lakes (Gunn et al. 1988; Table 4). Five of the study lakes supported lake trout (*Salvelinus namaycush*) populations (Blue Chalk, Clear, Cradle, Delano and Harp); whereas 5 lakes supported brook trout (*Salvelinus fontinalis*) populations (Crosson, Harp, Pearceley, Plastic and Westward). Although the survey indicated that brook trout were very rare in Plastic Lake. Four lakes contained smallmouth bass (*Micropterus dolomieui*; Harp, Hamer, Heney and Young) and one lake (Skidway) had largemouth bass (*Micropterus salmoides*). Clear Lake had the most species (12), whereas Pincher Lake had only two species (common white sucker, *Catostomus commersoni* and pearl dace, *Semotilus margarita*). Recent evidence indicates that the lake-trout fishery in Delano Lake has declined dramatically over the past 20 years, although the reason for this decline has not been established (Monroe and Hicks 1985).

Benthos

The fall 1989 kick-and-sweep survey of the littoral zone invertebrates in the 14 lakes yielded 197 genera (302 species) from 30 major taxonomic groups (including the subfamilies of Chironomidae). The number of individual organisms ranged from 1237 (Cradle) to 8728 (Pincher), with a mean of 4636 (Table 5). The number of genera ranged from 54 (Pearceley) to 98 (Harp), with a mean of 79. A summary of the abundance data for each lake is presented in Table 6 and a summary of the number of genera is in Table 7 (and also see Appendix 4 - Species Codes; and Appendix 5 - Species Lists for Each Lake). Appendix 6 summarizes the benthic data by major taxonomic group.

The total number of individuals and the total number of genera from each lake were standardized to Z-scores across the 14 lakes (i.e., to a mean of 0.0 and a SD of 1.0) and plotted on bivariate axes to search for groupings among the lakes (see Figure 2). Crosson, Delano, Hamer, Westward and Young lakes had more genera and more individuals than the average (i.e., relative to [0, 0] on the plot). Harp and Blue Chalk lakes had a greater number of genera, but fewer individuals than the average. Clear, Skidway, Heney and Pincher had a greater number of individuals, but fewer genera than the 14-lake average. Lastly, Plastic, Cradle and Pearceley had fewer individuals and fewer genera than the average.

The 3 dominant taxonomic groups for each lake were the Diptera, Amphipoda and Ephemeroptera based on total number of individuals, although Megaloptera and Odonata were the third most abundant taxa in Pearceley and Skidway lakes, respectively (Table 8). Diptera, Trichoptera and Odonata predominated according to the total number of genera, although Oligochaeta ranked third in Crosson and Westward. The third ranked taxa in Pearceley and Young were tied between Odonata/Ephemeroptera and Ephemeroptera/Coleoptera, respectively. Seventy-one genera were found in only one of the study lakes in 1989 (Table 9), whereas 11 genera from 6 taxonomic groups were collected in all 14 lakes (Table 10).

Diversity

Information on taxonomic richness (i.e., the number of genera in a sample) and the number of individuals in each genera is combined to produce a single number in diversity indices. H' in this survey ranged from 1.082 to 1.432 with an average of 1.297 (Table 11). Evenness values (which are standardized diversities that range from 0 to 1) ranged from 0.554 to 0.770, with an average of 0.687.

Diversity indices were contrasted statistically to compare the benthic communities across lakes (Table 11; e.g., see Zar 1984). This comparison revealed several groups of lakes with similar diversities. For example, Young (1.082), Clear (1.096) and Pearceley (1.114) lakes were grouped together with the lowest diversities. Blue Chalk, Skidway, Hamer, Heney, Westward, Cradle, Harp and Pincher formed a second group of lakes with similar diversities (1.291 to 1.360). Plastic Lake had a diversity (1.386) that did not differ significantly from this latter set of lakes if Blue Chalk was omitted. By contrast, Delano (1.432) and Crosson (1.420) lakes grouped together with the highest diversities.

Patterns in the Benthic Community

The correspondence analysis of the log(X+1) transformed data summarized 40% of the overall variation in the first 2 axes. Distinct groupings of lakes were apparent in the resultant plot (Figure 3). The 14 lakes formed an elongated cluster about the centroid [0, 0] for CA1 and CA2. The CA based on the presence-absence data summarized a similar amount of variation in the first two axes (i.e., 37%; see Figure 3). The presence-absence CA produced groupings of lakes that resembled the results from the log(X+1) CA suggesting that trends in community composition were dominated by the presence or absence of various genera.

Comparison of the Benthos from 1988 and 1989

The 1988 and 1989 fall surveys produced similar mean numbers of genera (i.e., 82 in 1988 and 79 in 1989; Tables 5 and 12). The mean number of individuals was 4214 in 1988 and 4636 in 1989 (Tables 5 and 13). The Z-score comparison of the 12 lakes that were sampled in both 1988 and 1989 revealed how these metrics varied among lakes and between years (Figure 4). The 1988 plots are dominated by the above-average number of individuals found in Hamer and Skidway lakes (7923 and 8896, respectively), and the low number of genera in Pincher Lake (62). The plot of H' versus the number of genera is strongly influenced by the low diversity in Hamer and Young lakes in 1988.

In comparison, the 1989 Z-score plots of the number of genera versus the number of individuals, and the number of genera versus H' present an even scatter of points around the centroid (Figure 4). The plot of H' versus number of individuals is strongly influenced by the low diversity in Clear and Pincher lakes in 1989. A comparison of the rank order between years indicates that 5 lakes (i.e., Skidway, Pincher, Harp, Delano and Crosson) changed positions more than the other lakes. For example, Skidway Lake decreased in the number of genera from a rank of 1 to 12; in the number of indivduals from 1 to 5; and in diversity from 2 to 4. Pincher Lake increased in rank order in the number of individuals from 11 to 1, with a modest increase in the number of genera (from a rank of 12 to 9) and a decline in diversity (from a rank of 3 to 8). Each of Harp, Delano and Crosson lakes increased in rank order of the number of genera from 1988 to 1989 (i.e., 7 to 1, 6 to 3, and 8 to 2, respectively). The number of individuals in Harp and Crosson lakes declined in rank (i.e., from 7 to 1 and 6 to 3, respectively), whereas diversity increased (i.e., from 10 to 6, and 7 to 2, repectively). By contrast, rank order of the number of individuals in Delano increased from 12 to 8, and diversity increased from a rank of 8 to 1.

In 1988, 60 genera (75 species) were found in only one lake (Reid et al. 1994b), and this number increased to 71 genera (87 species) in 1989 (see Table 9). Of these genera, 19 were found in only one lake in both 1988 and 1989 (Table 14). Four unique species of four genera were collected from Young Lake in both years, 3 in Pincher, two in Hamer, and one in each of Blue Chalk and Skidway lakes. The other 11 unique species were each identified in different lakes in different years. These species belonged to 11 different genera from major taxonomic groups (i.e., Oligochaeta, Amphipoda, Hydracarina, Ephemeroptera, Odonata, Hemiptera, Trichoptera, Coleoptera, Diptera and Gastropoda). Only Plastic and Crosson lakes yielded no unique species. By contrast, 13 genera (14 species) were found in all 12 study lakes in both 1988 and 1989 (Table 15).

The CA ordination of the 1988 log(X+1) transformed data summarized 41% of the variation in the first two axes (Figure 5; using only 12 lakes). The ordination of the 1989 data for the same 12 lakes resulted in 43% of the variation in the first two axes (compare this ordination with that for all 14 lakes (40%) in Figure 3). When the ordinations for the 1988 and 1989 data are compared, there is considerable similarity in the relative positions for 11 of the lakes (Figure 5). However, Pincher Lake changes position in 1989 to reflect a three-fold increase in sample abundance (2819 to 8728 indivduals, Table 5).

The CA ordination of the presence-absence data for 1988 and 1989 (Figure 6) closely resembled the results of the CA of the 1988 and 1989 log(X+1) abundance data (Figure 5); with the presence-absence CA incorporating 37% and 40% of the variation in the first two axes (versus 41% and 43% for the log(X+1) CA). The 12 lakes formed an elongated cluster about the centroid [0, 0] for CA1 and CA2. This pattern suggests that the composition of the benthic communities are relatively consistent across lakes and years. Those lakes which are repeatedly grouped together appear to exhibit similar benthic communities.

In the positive half of the ordination along CA1, Blue Chalk, Harp and Young lakes are clustered together to be somewhat separate from Clear and Westward lakes (Figure 6). Crosson seems to be an outlier, especially in the 1989 data set. By contrast, lakes on the negative end of CA1 are relatively evenly scattered, suggesting that the remaining 6 lakes are somewhat dissimilar. Several lakes tend to group together along CA2, with Skidway and Hamer, and Cradle and Pincher lying in opposite quadrants. Delano and Plastic lakes lie near the centroid in both years. Just why the communities in Cradle, Hamer, Skidway and Pincher lakes are different may be revealed in the correlation analysis comparing these biological metrics with the environmental variables that is presented below.

Spatial and Temporal Variation

To compare the nature of spatial and temporal variation in abundances, we estimated spatial and temporal sums of squares using a two-way ANOVA to partition variation in abundance according to differences among sites nested within lakes versus differences between years (i.e., 1988 and 1989; e.g., see Reid et al. 1995). We plotted the spatial sum of squares for each lake as a percentage of the total variance versus the proportion of the total variance explained by the ANOVA model. The sum of squares associated with the ANOVA model is simply the sum of the spatial and temporal sums of squares. The total variance or the total sum of squares is the sum of the spatial, temporal and error sums of squares.

Spatial-temporal variation is plotted for 24 of the major taxonomic groups (Figure 7). The relative position of each lake in each plot is indicated by a two-letter lake code if that taxon was found in that lake (see Table 4 for the lake codes). For example, a large proportion of the variation in amphipod abundance was incorporated into the two-way ANOVA for Skidway, Pincher, Delano, and Harp lakes (i.e., >80% of the total variation). Almost all of the variation in amphipod abundance in Plastic, Delano and Blue Chalk lakes was associated with spatial or site-to-site differences in abundance. By contrast, temporal variation (i.e., differences between the 1988 and 1989 collections) approximated the magnitude of spatial variation in Young, Harp and Skidway lakes. This example indicates that variation in the abundances of a particular taxon can differ considerably from lake to lake. One explanation for these differences arises from the observation that the habitat characteristics of the 5 sites differed more in some lakes than in others (e.g., see Table 2). The consequences of these differences will be assessed in subsequent reports.

The spatial-temporal plots (Figure 7) revealed that the spatial factor accounted for most of the variation in the abundances of most taxa. For example, spatial variation exceeded temporal variation in all lakes for 7 groups including Amphipoda, Diptera - Tanypodinae, Tipulidae, Tabanidae, Lepidoptera, Turbellaria and Pelecypoda. Spatial variability also predominated in the majority of the lakes for the Nematoda, Oligochaeta, Hirudinea, Gastropoda, Coleoptera, Ephemeroptera, Odonata, Hemiptera, Megaloptera and several of the Diptera (i.e., Ceratopogonidae, Chironominae, Chironomini, Tanytarsini, Orthocladiinae and Total Diptera). The greater spatial variability suggests that these taxa may not be good indicators to monitor temporal changes in abundance because within-lake variability predominates. Perhaps substrate-related differences among the sites within a lake should be taken into account before temporal changes can be adequately evaluated. Work on this issue is underway.

Of the various taxonomic groups, Trichoptera, Ephemeroptera and the Diptera - Chironominae - Chironomini exhibited marked temporal variation in 4 or more lakes. Thus, year-to-year differences in the abundances of these taxa tended to exceed within-lake spatial variation. Similar analyses with additional years of data will be required to establish whether these taxa will be useful indicators. Given that this analysis only spans two years, the observed temporal variation may simply arise from undocumented sampling or sorting inconsistencies. Data from subsequent years should help to resolve this question, especially as the length of the time period is increased.

Three lakes, Pincher, Skidway and Young, had 10, 6 and 4 taxonomic groups, respectively, with greater temporal variation than spatial. The benthic communities of these lakes may be changing over time. Future studies will verify this observation.

To identify lakes with similar spatial-temporal trends, we calculated Spearman rank correlations between all possible pairs of lakes using: 1) spatial variation as a proportion from the ANOVAs; and 2), the analogous temporal variation for the 24 major taxonomic groups (Table 16). In the spatial matrix, there were only two significant ($P<0.05$) correlations among the 66 pair-wise values. Consequently, many of the lakes exhibited unique patterns in the rank order of the spatial variation of the 24 taxa. Of these two significant correlations, Hamer Lake was positively correlated with Crosson, and Crosson was also correlated with Westward. Thus, these pairs of lakes exhibited similarities with respect to whether particular taxa exhibited large or small spatial sums of squares. No lake pair displayed opposite rankings in spatial variation that would result in a significant negative rank correlation.

Only one pair of lakes exhibited a significant rank correlation in the temporal matrix (i.e., Cradle and Clear lakes). The small number of significant correlations among the 66 pair-wise spatial and temporal comparisons is likely a "chance" product of calculating a large number of correlations, and hence, the relevance of these correlations will not be explored further. The fact that most of these correlations were not significant suggests that the rank order of the temporal and spatial variability differ appreciably among the lakes.

Two-way ANOVAs were also calculated using the ordination axes as well as the 3 univariate metrics (i.e., the number of individuals, number of taxa and diversity). Spatial variation within the lakes accounted for the majority of the variation in both the univariate and multivariate metrics (Table 17). Year-to-year or temporal variation ranged from 0.02% for the number of individuals to 1.6% for CA2 from the presence-absence data. The two-way ANOVA explained over 70% of the variance in H', CA1 for the presence-absence data, and both CA axes for the log(X+1) abundance data. Between 50-60% of the variation in the number of taxa and the number of individuals was summarized by the two-way ANOVA. By contrast, only 32.5% of the variation in CA2 for the presence-absence data was explained by the spatial and temporal factors.

The two-way ANOVA of the univariate and multivariate biological metrics emphasizes that within-lake, or site-to-site differences predominate (Table 17). Given that one objective of the LRTAP programme is to detect long-term (or temporal) changes in the biological metrics, special ways to "control" or factor-out within-lake heterogeneity must be considered. One aspect of this site-to-site heterogeneity is obvious differences in substrate. Future re-sampling of these lakes will include a quantitative assessment of the types and diversity of the substrates (i.e., habitat) at each site. A protocol has been developed for this purpose and the results will be examined in subsequent reports.

Environmental Correlates of the Biological Metrics

The univariate metrics (i.e., the number of taxa, the number of individuals and H') and the 4 multivariate metrics (i.e., the first two CA axes for the ordination of the presence-absence and log[X+1] abundance data) were correlated with 18 chemical and 4 morphological variables. Both Pearson and Spearman rank correlations were compared to establish whether outliers or curvilinear patterns existed (i.e., outliers are implicated if $r>r_s$, whereas a curvilinear relationship is suggested if $r_s > r$).

The number of taxa was significantly correlated with alkalinity, calcium, conductivity, dissolved inorganic carbon, potassium, magnesium, sodium, nitrate, sulphate and total phosphorus concentrations (Table 18). The rank correlations with these same variables were also significant ($P<0.05$). Only the rank correlation with DOC was significant ($P<0.05$) suggesting that a curvilinear relationship exists between DOC and the number of taxa. None of the lake morphology variables was significantly correlated with the number of taxa.

By contrast, the number of individuals was significantly correlated with only nitrate concentration (Table 18), although the rank correlation with potassium was also significant ($P<0.05$). H' diversity exhibited a significant negative correlation with lake area, suggesting that diversity declined in the larger lakes. However, the corresponding rank correlation was not significant. This discrepancy implies that the Pearson correlation was probably biased by an outlier. The only rank correlation that was significant was with the iron concentration. Here, the absence of a significant Pearson correlation between H' and iron suggests a curvilinear relationship.

For the multivariate metrics, CA1 based on presence-absence data was only monotonically correlated with the aluminum concentration ($r_s=-0.590$, $P<0.05$; Table 18). None of the Pearson correlations with this axis was significant. By contrast, both Pearson's and Spearman's correlations between CA2 and potassium were significant ($P<0.05$), and the rank correlation with chloride was also significant. All of the significant correlations with CA2 were negative, indicating an increase in the concentration of a particular parameter as one moves from the top to the bottom of the CA ordination (Figure 3). Crosson and Pincher lakes lie at the positive end of CA2 suggesting that these two lakes had lower concentrations of many of the chemical parameters.

None of the Pearson correlations between the first two CA axes for the log(X+1) abundance data and the environmental data was significant ($P>0.05$). Abundance CA1 had a significant negative rank correlation with Al, whereas CA2 exhibited significant positive rank correlations with chloride and potassium, much like CA2 from the presence-absence data. Lake morphology was not correlated with any of the biological metrics.

For comparison, the same 7 metrics from the 1988 survey (e.g., see Reid et al. 1994b) were also correlated with the 1988 environmental data. None of the Pearson and Spearman correlations with the number of taxa was significant with the 1988 data (Table 19). The Pearson correlations between the number of individuals and alkalinity and conductivity were both significant ($P<0.05$), although the corresponding rank correlation for alkalinity, but not conductivity was significant. As a result, the Pearson correlation with conductivity appeared to be biased by an outlier. In addition, rank correlations with iron and potassium were also significant ($P<0.05$), suggesting a positive curvilinear relationship with iron, and a negative curvilinear relationship with potassium.

For the 1988 data, there was a significant negative correlation between H' diversity and potassium (Table 19), but the rank correlation was not significant suggesting that the Pearson correlation was probably biased by an outlier. The CA ordination of the presence-absence matrix resulted in significant Pearson correlations between CA1 and conductivity, and CA2 with conductivity and manganese. Only the corresponding rank correlations between CA2 and conductivity and manganese were significant, suggesting that the correlation between CA1 and conductivity was unduely influenced by an outlier. Rank correlations between CA1 and calcium, and CA2 with iron were also significant.

The first CA axis of the log(X+1) abundance data was only correlated with conductivity in the 1988 data ($P<0.05$; Table 19). Moreover, only the rank correlations between CA1 and calcium and iron, and CA2 with iron were significant ($P<0.05$).

A simple comparison of the correlations for the 1989 and 1988 data revealed very little consistency. For example, approximately half of the environmental variables were correlated with the number of taxa in 1989, but none of these correlations was significant in 1988. Of the remaining correlations, only the rank correlation between the number of individuals and potassium was significant in both 1988 and 1989. Whether the differences between these results are due to changes in the benthic communities in response to changes in water chemistry or just chance variation from year to year remains to be established by similar comparisons in subsequent years. However, the significant correlations with alkalinity, aluminum, calcium, conductivity, DIC, DOC and sulphate in the 1989 data suggest that these biological metrics show promise for monitoring changes in littoral macroinvertebrate communities.

CONCLUSIONS

This report summarizes the kick-and-sweep benthic collections from 14 small, headwater lakes that were sampled in the fall of 1989. These results are also compared to similar data collected from 12 of the 14 lakes in 1988. Two sensitive, low-alkalinity lakes were added in 1989. The synoptic survey of the littoral benthos resulted in the collection of a total of 302 taxa with an average of 4636 organisms and 101 taxa from each lake. In the fall of 1988, an average of 4213 organisms from 103 taxa were collected from each of the 12 lakes. Diversity indices (H') calculated at the genus level of taxonomic resolution ranged from 1.08 to 1.43 with an average of 1.30 in 1989. Similarly, diversity ranged from 1.10 to 1.47 with an average of 1.31 in the fall of 1988. Although the ranges and averages were similar in 1988 and 1989, the observed values for a number of these metrics changed dramatically for a number of the lakes. The reasons for these short-term inconsistencies were not apparent.

In 1989, the major taxonomic groups contributing the greatest numbers of animals were the Diptera, Amphipoda and the Ephemeroptera. The Diptera, Trichoptera and Odonata dominated with respect to the total number of taxa. Of the over 300 taxa that were collected, 76 species were collected from only one lake in the fall of 1988 whereas 87 unique species were collected in 1989. Twenty ubiquitous species (i.e., collected from all lakes) were found in 1988, whereas only 15 ubiquitous taxa were found in 1989.

A multivariate ordination of the logarithmically transformed abundance data and the presence-absence data revealed several unusual lakes, but the general trends suggested that differences among the benthic communities were due to species presence or absence rather than differences in abundance. As with the univariate metrics (i.e., the number of individuals, number of taxa and diversity), there were considerable differences in the ordinations from 1988 and 1989.

An analysis of spatial and temporal variation indicated that temporal variation was relatively minor. The short, two-year data series may explain why temporal effects were unimportant. We expect that temporal effects will emerge when several additional years of data are added. Here, spatial variation representing differences among the 5 sites within a lake predominated. To account for this variation, future surveys will quantify nearshore substrates (or habitat) associated with each site. Once quantified, methods to factor-out or partial-out within-lake variability will be required.

The biological metrics were correlated with different environmental variables in 1988 and 1989. None of the rank correlations with lake morphology (i.e., area, volume, maximum depth and shoreline length) were significant. In 1989, the number of taxa was significantly correlated with more of the chemical parameters than any other biological metric. By contrast, the number of taxa was not correlated with any of the water chemistry variables in 1988. Most of the significant correlations in one year were not significant in the next. The reasons for these dramatic changes are under investigation.

Subsequent reports will document and compare results of the fall surveys that are conducted each year as part of the south-central Ontario component of the LRTAP biomonitoring programme. The following reports are being prepared:

1. results of synoptic surveys conducted in the fall of 1990, 1991 and 1992 with comparisons to the fall surveys of 1988 and 1989;

2. a quality assurance/quality control (QA/QC) study examining the repeatability of the kick-and-sweep protocol (i.e., Reid et al. 1995);

3. a study of the chironomid taxa in 20 headwater lakes with an emphasis on the environmental correlates of the observed patterns in community structure; and

4. an examination of the power and effectiveness of inexpensive rapid bioassessment protocols for lakes and streams.

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Table 1. Physical characteristics and location of the study lakes.

LAKE	SAMPLE DATE	LAT.	LONG.	COUNTY	TOWNSHIP	MAP	AREA (ha)	WATERSHED	ELEVATION (m)
BLUE CHALK	05 NOV 89	45 12	78 56	MUSKOKA	RIDOUT	31E2	52.4	2EC15	336
CLEAR	08 NOV 89	45 11	78 43	HALIBURTON	SHERBORNE	31E2	88.4	2HF8	369
CRADLE	07 NOV 89	45 28	78 35	HALIBURTON	LAWERENCE	31E7	17.9	2KD18	472.4
CROSSON	26 OCT 89	45 05	79 02	MUSKOKA	OAKLEY	31E3	56.7	2EC15	312
DELANO	08 NOV 89	45 31	78 36	NIPISSING	CANISBAY	31E10	23.9	2KD1	442
HAMER	01 NOV 89	45 14	79 48	PARRY SOUND	HUMPHREY	31E4	35.2	2EB5	221
HARP	23 OCT 89	45 23	79 07	MUSKOKA	CHAFFEY	31E6	71.4	2EB13	327
HENEY	26 OCT 89	45 08	79 06	MUSKOKA	McLEAN	31E3	21.4	2EB9	345
PEARCELEY	31 OCT 89	45 42	79 30	PARRY SOUND	CHAPMAN	31E11,12	44.1	2EA20	358
PINCHER	30 OCT 89	45 34	78 51	NIPISSING	McCRANEY	31E10	42.1	2EB13	510.1
PLASTIC	24 OCT 89	45 11	78 50	HALIBURTON	SHERBORNE	31E2	32.1	2HF10	379
SKIDWAY	31 OCT 89	45 12	79 52	PARRY SOUND	CONGER	31E4	18.5	2EB2	221
WESTWARD	30 OCT 89	45 29	78 47	NIPISSING	PECK	31E4	63.3	2EB11	429
YOUNG	06 NOV 89	45 13	79 33	MUSKOKA	WATT	31E4	105.9	2EB7	251.5

Table 2. Substrate description of the 70 sites (14 lakes by 5 sites per lake), Substrate types are listed in descending order based on the areal coverage of the predominant substrates (see Appendix 2 for greater detail).

LAKE	SITES 1	2	3	4	5
BLUE CHALK	CSD COB	LOS	LOS	CSD/PEB LOS	CSD
CLEAR	CSD COB	CSD COB	CSD LOS	CSD COB	LOS
CRADLE	LOS CSD COB	LOS	COB/PEB CSD/LOS	LOS	LOS
CROSSON	COB/PEB CSD LOS	LOS COB CSD	CSD LOS	CSD LOS	LOS COB CSD
DELANO	LOS	LOS/COB	LOS	LOS	BOU/LOS
HAMER	LOS	LOS/CSD	BDR	SLT COB/LOS	LOS SLT
HARP	LOS/CSD	COB CSD	CSD COB	CSD COB	LOS COB PEB CSD
HENEY	LOS/COB	LOS/COB	COB/SLT	LOS/SLT	CSD/COB
PEARCELEY	BDR	BDR	CSD/COB	COB	COB/LOS
PINCHER	COB/LOS	LOS	LOS CSD COB	LOS/COB	LOS
PLASTIC	COB LOS CSD	LOS	LOS	COB CSD SLT	LOS COB BOU
SKIDWAY	LOS	LOS	LOS	LOS	LOS CSD
WESTWARD	LOS CSD	LOS	CSD LOS COB	COB CSD	LOS COB
YOUNG	CSD PEB SLT/LOS	CSD LOS	CSD LOS	SLT LOS	CSD LOS

BDR	Bedrock	COB	Cobble	CSD	Coarse Sand
BOU	Boulder	PEB	Pebble	SLT	Silt
LOS	Highly Organic, Flocculent, Fine Particle Substrate				

Table 3. Ice-free mean water chemistry for the 14 lakes.

PARAMETER	BLUE CHALK	CLEAR	CRADLE	CROSSON	DELANO	HAMER	HARP	HENEY	PEARCELEY	PINCHER	PLASTIC	SKIDWAY	WESTWARD	YOUNG
ALKTI(GRAN) ueq.L^{-1}	84.2	8.3	12.7	12.1	48.5	9.9	68.5	12.3	-1.8	2.2	6.9	11.5	42.8	98.8
ALKT(TFE) ueq.L^{-1}	119.4	43.4	45.1	45.5	81.2	40.6	102.4	45.5	33.7	36.0	42.6	44.4	78.2	132.1
AL ug.L^{-1}	5	22	11	82	64	177	32	27	53	85	26	62	6	10
CA mg.L^{-1}	2.6	2.4	1.9	2.3	2.9	3.5	2.9	2.0	1.7	1.6	2.0	1.3	2.3	2.9
CL mg.L^{-1}	0.39	0.42	0.32	0.41	0.35	1.88	1.41	0.76	0.31	0.31	0.40	0.49	0.28	0.38
COND25 uS.cm^{-1}	28.5	25.7	22.0	26.9	32.3	38.2	35.0	24.9	19.7	21.9	22.3	19.3	24.3	31.8
DIC mg.L^{-1}	1.47	0.52	0.72	0.99	1.46	2.05	1.47	0.35	0.35	0.60	0.51	0.97	1.18	1.78
DOC mg.L^{-1}	1.8	1.5	1.5	4.1	5.1	9.6	3.6	2.8	2.2	2.6	2.0	3.8	1.5	3.0
FE ug.L^{-1}	52	20	118	200	238	333	65	64	55	91	69	506	74	39
K mg.L^{-1}	0.39	0.35	0.30	0.32	0.41	0.55	0.57	0.37	0.33	0.39	0.21	0.42	0.36	0.57
MG mg.L^{-1}	0.76	0.56	0.48	0.65	0.94	0.72	0.93	0.55	0.29	0.45	0.47	0.41	0.60	0.78
MN mg.L^{-1}	30	48	36	38	80	46	15	26	66	64	45	79	79	16
NA mg.L^{-1}	0.79	0.49	0.45	0.65	0.78	0.99	1.35	0.85	0.48	0.57	0.51	0.62	0.53	0.94
NH4 ug.L^{-1}	19	15	25	17	14	62	7	11	19	40	15	52	16	11
NO3 ug.L^{-1}	27	22	12	92	111	113	116	24	64	110	20	26	134	145
TKN ug.L^{-1}	193	144	176	273	276	453	218	225	188	234	181	335	163	223
pH	6.63	5.81	5.78	5.57	6.06	5.07	6.34	5.91	5.46	5.37	5.77	5.56	6.27	6.37
SO4 mg.L^{-1}	6.3	7.8	6.6	7.5	8.3	8.4	7.5	6.9	5.7	6.2	6.5	4.8	6.1	6.5
TOTAL PHOSPHORUS ug.L^{-1}	5.6	3.5	6.6	9.9	8.0	10.5	7.8	6.5	4.0	5.4	6.0	7.9	4.6	8.6

Table 4. Fish inventory for the 14 lakes.

SCIENTIFIC NAMES	LRTAP CODE	COMMON NAME	LAKE CODE [1]												
			BC	CL	CR	CN	DO	HR	HP	HY	PC	PN	PY	SY	WD
Family Salmonidae															
Subfamily Salmoninae															
Salvelinus fontinalis	163	Brook Trout	—	—	—	P	—	—	P	—	P	—	P	—	P
Salvelinus namaycush	166	Lake Trout	P	P	P	—	P	—	P	—	—	—	—	—	—
Hybrid		Hybrid	—	—	P	—	—	—	—	—	—	—	P	—	—
Subfamily Coregoninae															
Coregonus artedii	142	Cisco	—	—	—	—	—	—	P	—	—	—	—	—	—
Family Osmeridae															
Osmerus mordax	138	Rainbow Smelt	—	—	P	—	—	—	—	—	P	—	—	—	—
Family Catostomidae															
Catostomus commersoni	26	White Sucker	P	P	—	P	P	—	P	P	P	P	P	P	P
Family Cyprinidae															
Phoxinus eos	71	Northern Redbelly Dace	P	P	P	—	P	—	—	—	P	—	P	—	P
Couesius plumbeus	44	Lake Chub	—	—	—	—	—	—	—	—	—	—	—	—	P
Hybognathus hankinsoni	47	Brassy Minnow	P	—	—	—	—	—	—	—	—	—	—	—	—
Notemigonus crysoleucas	53	Golden Shiner	P	—	—	P	—	—	—	—	P	—	—	—	—
Notropis cornutus	60	Common Shiner	—	P	—	—	P	—	—	—	—	—	—	—	P
Notropis heterodon	62	Blackchin Shiner	P	—	—	—	—	—	—	—	—	—	—	—	—
Notropis heterolepis	63	Blacknose Shiner	—	—	—	P	—	—	—	—	—	—	—	—	P
Pimephales notatus	73	Bluntnose Minnow	—	P	—	—	—	—	—	—	—	—	—	—	—
Pimephales promelas	74	Fathead Minnow	—	P	—	—	—	—	—	—	—	—	—	—	P
Rhinichthys atratulus	75	Blacknose Dace	—	—	—	—	—	—	—	—	—	—	—	—	—
Semotilus atromaculatus	78	Creek chub	P	P	P	P	P	—	—	—	P	—	P	—	—
Semotilus margarita	80	Pearl Dace	—	P	P	—	P	—	—	—	P	P	P	—	—
Family Ictaluridae															
Ictalurus nebulosus	173	Brown Bullhead	P	—	—	P	—	P	—	P	P	—	—	—	—
Family Cadidae															
Lota lota	81	Burbot (ling)	P	—	—	—	—	—	P	—	—	—	—	—	—
Family Gasterosteidae															
Culaea inconstans	84	Brook Stickleback	—	—	P	—	P	—	—	—	—	—	—	—	P
Family Centrarchidae															
Ambloplites rupestris	90	Rock Bass	—	—	—	—	—	—	—	—	P	—	—	—	—
Lepomis gibbosus	94	Pumpkinseed	P	P	—	P	—	—	—	P	P	—	—	P	—
Micropterus dolomieui	99	Smallmouth Bass	—	—	—	—	—	P	P	P	—	—	—	—	—
Micropterus salmoides	100	Largemouth Bass	—	—	—	—	—	—	—	—	—	—	—	P	—
Family Percidae															
Perca flavescens	122	Yellow Perch	—	P	—	P	—	P	—	—	P	—	—	P	—
Etheostoma exile	117	Iowa Darter	—	—	—	—	—	—	—	—	—	—	—	—	—

1 - Lake Codes: BC = Blue Chalk, CL = Clear, CR = Cradle, CN = Crosson, DO = Delano, HR = Hamer, HP = Harp, HY = Heney, PC = Plastic, PN = Pincher, PY = Pearceley, SY = Skidway, WD = Westward, YG = Young

Table 5. Taxonomic richness and abundance data for the fall benthic invertebrate collections (1988, 1989).

LAKE	TOTAL # OF GENERA		TOTAL # OF INDIVIDUALS	
	88	89	88	89
BLUE CHALK	86	87	3552	2785
CLEAR	79	78	2851	5058
CRADLE	73	61	3190	1237
CROSSON	82	97	4915	5423
DELANO	83	95	2189	4757
HAMER	86	91	7923	6217
HARP	83	98	4334	2821
HENEY		77		4698
PEARCELEY		54		2336
PINCHER	62	71	2819	8728
PLASTIC	77	63	3306	2006
SKIDWAY	92	61	8912	5435
WESTWARD	91	84	3328	6188
YOUNG	87	90	3244	7321
MEAN	82	79	4214	4636
RANGE	62-92	54-98	2189-7923	1237-8728

Table 6. Summary of the number of individuals collected in each lake (using 2-letter lake codes) for each of the major taxonomic groups.

TAXONOMIC NAME	BC	CL	CR	CN	DO	HR	HP	HY	PY	PN	PC	SK	WD	YG
COELENTERATA							1							
TURBELLARIA	7			4			16	2			2		51	
NEMATODA	19	4	2	15	3	1	13	3			3	1	47	1
OLIGOCHAETA	113	69	7	49	47	13	42	22	17	7	21	3	216	14
HIRUDINEA	2	2	7	2	18	1	1	7	1	11	1	1	1	
ISOPODA												24		
AMPHIPODA	914	2486	224	814	705	1531	817	287		733	106	109	620	34
DECAPODA									1				1	
HYDRACARINA				25	4	16	10	10	1					
COLLEMBOLA				3										
EPHEMEROPTERA	298	584	169	762	858	1552	147	309	220	930	49	444	774	2
ODONATA	47	85	59	148	129	389	122	173	44	546	38	179	19	2
PLECOPTERA	1													
HEMIPTERA	1		18	1	3	22			13	93		5	6	
MEGALOPTERA		19	1	6		15			143			2	7	
NEUROPTERA						1								
TRICHOPTERA	64	275	47	103	132	420	57	27		608	39	156	41	12
LEPIDOPTERA		15				1	2			1			12	
COLEOPTERA	109	19	9	328	175	17	85	37	1	29		2	83	24
DIPTERA TOTAL	**1187**	**1455**	**682**	**3084**	**2450**	**2148**	**1180**	**3773**	**1891**	**5645**	**1544**	**4451**	**3728**	**264**
DIPTERA:Ceratopogonidae	53	94	39	60	141	472	107	75	3	275	79	269	421	10
DIPTERA:Chironomidae	1131	1358	642	3022	2304	1674	1071	3698	1888	5365	1465	4181	3307	254
Subfam.-Podonominae														
Subfam.-Tanypodinae	634	181	74	981	647	512	230	694	228	695	358	630	191	86
Subfam.-Diamesinae														
Subfam.-Prodiamesinae		6					29						4	
Subfam.-Orthocladiinae	67	143	110	608	119	176	129	783	58	1183	353	398	113	18
Subfam.-Chironominae	430	1029	458	1433	1538	986	683	2221	1602	3487	754	3153	2999	148
Tribe-Chironomini	198	823	346	666	1064	919	441	1357	1272	2341	495	2705	1564	52
Tribe-Tanytarsini	232	205	112	767	474	67	242	864	330	1146	259	448	1435	96
DIPTERA:Tabanidae				1	2	2	2			4		1		
DIPTERA:Tipulidae		1		1	3									
DIPTERA:Culicidae														
DIPTERA:Misc.	3	2								1				
DIPTERA:Chaoboridae			1											
GASTROPODA	3	12		65	184	8	231	18	1		11		16	15
BIVALVIA	20	33	12	14	49	82	97	30	4	121	192	58	566	5
TOTAL INDIVIDUALS	2785	5058	1237	5423	4757	6217	2821	4698	2337	8728	2006	5435	6188	732

Table 7. Summary of the number of genera collected in each lake at the order or sub-family taxonomic level.

TAXONOMIC NAME	BC	CL	CR	CN	DO	HR	HP	HY	PY	PN	PC	SY	WD	YG
COELENTERATA							1							
TURBELLARIA (Tricladida)	1			1			1	1			1		1	1
NEMATODA	2	2	1	3	1	1	3	2			2	1	2	2
OLIGOCHAETA	6	3	2	9	3	2	7	7	3	2	3	2	8	4
HIRUDINEA	1	1	2	2	3	1	1	3	1	2	1	1	1	2
ISOPODA												1		
AMPHIPODA	2	2	2	2	2	3	2	2		2	1	2	2	2
DECAPODA									1				1	1
HYDRACARINA				5	3	5	5	4	1					1
COLLEMBOLA				1										
EPHEMEROPTERA	7	5	4	6	5	4	5	4	4	2	2	3	5	8
ODONATA	8	12	7	8	10	14	8	9	4	8	7	8	4	6
PLECOPTERA	1													
HEMIPTERA	1		4	1	2	2			3	4		2	1	
MEGALOPTERA		1	1	1		1						1	1	1
NEUROPTERA						1								
TRICHOPTERA	10	14	8	14	12	12	13	8	8	13	10	10	11	12
LEPIDOPTERA		1				1	1			1			1	1
COLEOPTERA	5	3	3	5	8	3	3	2	1	6		3	3	8
DIPTERA TOTAL	40	31	26	35	41	38	44	30	26	29	33	26	40	34
DIPTERA:Ceratopogonidae	4	2	4	3	3	5	5	2	1	2	3	3	4	3
DIPTERA:Chironomidae	35	26	21	30	36	32	38	28	25	25	30	22	36	29
Subfam.-Podonominae														
Subfam.-Tanypodinae	8	4	4	7	8	6	7	6	4	4	6	6	6	7
Subfam.-Diamesinae						1								1
Subfam.-Prodiamesinae		1					1						1	
Subfam.-Orthocladiinae	7	6	3	5	8	5	7	4	4	4	5	2	9	4
Subfam.-Chironominae	20	15	14	18	20	20	23	18	17	17	19	14	20	17
Tribe-Chironomini	15	12	11	13	17	17	18	14	14	14	16	11	15	13
Tribe-Tanytarsini	5	3	3	5	3	3	5	4	3	3	3	3	5	4
DIPTERA:Tabanidae				1	1	1	1			1		1		
DIPTERA:Tipulidae		1		1	1									1
DIPTERA:Culicidae														
DIPTERA:Misc.	1	2								1				1
DIPTERA:Chaoboridae			1											
GASTROPODA	2	2		3	3	2	3	3	1	1	2		2	6
BIVALVIA	1	1	1	1	2	1	1	2	1	1	1	1	1	1
TOTAL GENERA	87	78	61	97	95	91	98	77	54	71	63	61	84	90

Table 8. Listing of the dominant benthic taxa ranked by number of individuals, and by number of genera.

LAKE	DOMINANT TAXA BY COUNT	COUNTS FALL 1989	DOMINANT TAXA BY GENERA	TOTAL GENERA FALL 1989
BLUE CHALK	DIPTERA	1187	DIPTERA	40
	AMPHIPODA	914	TRICHOPTERA	10
	EPHEMEROPTERA	298	ODONATA	8
CLEAR	AMPHIPODA	2486	DIPTERA	31
	DIPTERA	1455	TRICHOPTERA	14
	EPHEMEROPTERA	584	ODONATA	12
CRADLE	DIPTERA	682	DIPTERA	26
	AMPHIPODA	224	TRICHOPTERA	8
	EPHEMEROPTERA	169	ODONATA	7
CROSSON	DIPTERA	3084	DIPTERA	35
	AMPHIPODA	814	TRICHOPTERA	14
	EPHEMEROPTERA	762	OLIGOCHAETA	9
DELANO	DIPTERA	2450	DIPTERA	41
	EPHEMEROPTERA	858	TRICHOPTERA	12
	AMPHIPODA	705	ODONATA	10
HAMER	DIPTERA	2148	DIPTERA	38
	EPHEMEROPTERA	1552	ODONATA	14
	AMPHIPODA	1531	TRICHOPTERA	12
HARP	DIPTERA	1180	DIPTERA	44
	AMPHIPODA	817	TRICHOPTERA	13
	EPHEMEROPTERA	147	ODONATA	8
HENEY	DIPTERA	3773	DIPTERA	30
	EPHEMEROPTERA	309	ODONATA	9
	AMPHIPODA	287	TRICHOPTERA	8
PEARCELEY	DIPTERA	1891	DIPTERA	26
	EPHEMEROPTERA	220	TRICHOPTERA	8
	MEGALOPTERA	143	ODONATA/EPHEMEROPTERA	4
PINCHER	DIPTERA	5645	DIPTERA	29
	EPHEMEROPTERA	930	TRICHOPTERA	13
	AMPHIPODA	733	ODONATA	8
PLASTIC	DIPTERA	1544	DIPTERA	33
	AMPHIPODA	106	TRICHOPTERA	10
	EPHEMEROPTERA	49	ODONATA	7
SKIDWAY	DIPTERA	4451	DIPTERA	26
	EPHEMEROPTERA	444	TRICHOPTERA	10
	ODONATA	179	ODONATA	8
WESTWARD	DIPTERA	3728	DIPTERA	40
	EPHEMEROPTERA	774	TRICHOPTERA	11
	AMPHIPODA	620	OLIGOCHAETA	8
YOUNG	AMPHIPODA	3434	DIPTERA	34
	DIPTERA	2647	TRICHOPTERA	12
	EPHEMEROPTERA	270	EPHEMEROPTERA/COLEOPTERA	8

Table 9. Listing of the species found only in one lake, in the 1989 fall survey.

MOE ID CODE	SPECIES	LAKE	RELATIVE ABUNDANCE
	COELENTERATA		
1	Hydra sp	HARP	1
	OLIGOCHAETA		
303	Aulodrilus piqueti	CROSSON	6
315	Nais communis	WESTWARD	1
317	Nais simplex	WESTWARD	1
318	Stylaria lacustris	BLUE CHALK	4
322	Tasserkidrilus harmani	HARP	1
327	Uncinais uncinata	CROSSON	2
328	Vejdovskyella comata	CROSSON	1
329	Nais variabilis	CROSSON	4
	ISOPODA		
502	Asellus forbesi	SKIDWAY	24
	AMPHIPODA		
602	Crangonyx gracilis	BLUE CHALK	1
608	Diporeia hoyi	HAMER	67
	DECAPODA		
701	Cambarus bartoni	WESTWARD	1
702	Cambarus (P) robustus	WESTWARD	1
704	Orconectes virilis	YOUNG	1
706	Orconectes propinquus	YOUNG	1
	HYDRACARINA		
808	Arrenurus (Mega) cardiacus	HAMER	1
810	Arrenurus (Mega) megalurus	HARP	1
816	Hydrodroma americanus	CROSSON	1
818	Hygrobates longipalpis	HARP	1
820	Hygrobates neocalliger	CROSSON	1
826	Limnesia undulata	HAMER	1
832	Arrenurus (Mega) bergei	HAMER	1
834	Arrenurus (Mega) elevatus	YOUNG	1
	COLLEMBOLA		
904	Hypogastrura sp	CROSSON	3
	EPHEMEROPTERA		
1009	Eurylophella nr latulenta	YOUNG	2
1024	Siphloplecton basale	YOUNG	5
	ODONATA		
1101	Aeshna canadensis	HAMER	2
1105	Argia violacea	HAMER	5
1117	Dromogomphus spinosus	YOUNG	2
1133	Lestes disjunctus	PINCHER	4
1150	Somatochlora cingulata	CLEAR	2
	PLECOPTERA		
1201	Isoperla marlynia	BLUE CHALK	1
	HEMIPTERA		
1302	Cenocorixa n sp	CRADLE	2
1314	Hesperocorixa vulgaris	PINCHER	2
1316	Notonecta (Paranecta) insulata	PINCHER	47
1328	Sigara (Phaeo) macropala	PINCHER	20
1329	Sigara (Phaeo) nr mississippiensis	DELANO	1
1330	Sigara (Pileo) douglasensis	CRADLE	2
1332	Sigara (Vermi.) deflecta	CRADLE	2
1334	Sigara (Vermi) johnsoni	SKIDWAY	2
	NEUROPTERA		
1502	Climacia areolaris	HAMER	1
	TRICHOPTERA		
1603	Agrypnia improba	PINCHER	2
1608	Banksiola smithi	PINCHER	93
1615	Diplectrona modesta	HARP	1
1616	Lype diversa	CROSSON	1
1619	Leptoceridae	YOUNG	4
1630	Oecetis cinerascens	CROSSON	1
1645	Phryganea sp	HAMER	1
1648	Phylocentropus sp	YOUNG	2
	LEPIDOPTERA		
1709	Paraponyx sp	HAMER	1
	COLEOPTERA		
1837	Phytosus sp	CROSSON	1
1848	Berosus sp	YOUNG	31
1850	Coptotomus longulus	PINCHER	2

Table 9. cont'd Listing of the species found only in one lake, in the 1989 fall survey.

MOE ID CODE	SPECIES	LAKE	RELATIVE ABUNDANCE	MOE ID CODE	SPECIES	LAKE	RELATIV ABUNDAN
	DIPTERA:Ceratopogonidae			2792	Thienemanniella sp A (ELA)	WESTWARD	11 9
2101	Alluaudomyia sp	HARP	1		**Subfam. Chironominae**		
2114	Bezzia sp 5	SKIDWAY	2		**Tribe-Chironomini**		
2130	Dasyhelea sp 2 (dark head)	WESTWARD	246	2940	Parachironomus abortivus	HARP	1
2142	Palpomyia sp 1 tibialis gr	HAMER	2	2948	Paralauterborniella nigrohalterale	HARP	6
2154	Stilobezzia sp	HARP	2	2958	Polypedilum (Pentapedilum) tritum	WESTWARD	14 8
	Subfam. Tanypodinae				**Tribe-Tanytarsini**		
2405	Ablabesmyia (s str) janta	DELANO	1	3014	Tanytarsus sp 'Pc-brush'	CROSSON	16 8
2416	Labrundinia pilosella	BLUE CHALK	2		**DIPTERA: Tabanidae**		
2419	Labrundinia sp 1	BLUE CHALK	3	3102	Chrysops ater	HAMER	1
2422	Larsia indistincta	SKIDWAY	56 6		**DIPTERA: Tipulidae**		
2424	Natarsia baltimoreus	SKIDWAY	22 9	3211	Pedicia sp	CLEAR	1
	Subfam. Diamesinae				**DIPTERA: Misc.**		
2501	Potthastia sp.1 longimana gr	YOUNG	1	3304	Chaoborus (Sayomyia) punctipennis	CRADLE	1
2503	Potthastia sp.2 longimana gr	HAMER	5	3308	Dolichopodidae	CLEAR	1
	Subfam. Orthocladiinae				**GASTROPODA**		
2714	Corynoneura sp 1	BLUE CHALK	4	3503	Campeloma decisum	YOUNG	1
2717	Corynoneura sp 3	WESTWARD	5	3506	Physella (s.str) gyrina	YOUNG	4
2719	Cricotopus (s str) sp bicinctus gr	HAMER	1		**PELECYPODA**		
2752	Nanocladius (s str.) nr minimus	DELANO	1	3606	Pisidium lilljeborgi	HAMER	1
2761	Parakiefferiella sp.4	WESTWARD	22 9	3614	Pisidium equilaterale	HARP	1
2782	Pseudosmittia sp 1	HARP	1	3622	Musculim securis f jayense	DELANO	1
2784	Rheocricotopus sp	CLEAR	14 4				

Table 10. Listing of the species common to all 14 lakes, in the 1989 fall survey.

MOE IDCODE	SPECIES
1000	**EPHEMEROPTERA**
1012	Eurylophella temporalis
1032	Leptophlebia cupida
1600	**TRICOPTERA**
1658	Pycnopsyche sp.
2100	**DIPTERA Ceratopogonidae**
2400	**Subfam. Tanypodinae**
2426	Procladius (Holotanypus) sp.
2700	**Subfam.-Orthocladiinae**
2774	Psectrocladius (s.str.) litofilus
2800	**Subfam.-Chironominae**
2900	**Tribe-Chironomini**
2914	Dicrotendipes modestus
2918	Dicrotendipes tritomus
2928	Microtendipes pedellus
2986	Tribelos jucundum
3000	**Tribe-Tanytarsini**
3002	Cladotanytarsus sp.
3016	Tanytarsus/Micropsectra spp
3600	**BIVALVIA**
3602	Pisidium casertanum

Table 11. The diversity-evenness data for the 14 lakes with the corresponding pair-wise matrix of between lake comparisons using H'. Values above the diagonal are t-values and their associated probabilities are below the diagonal.

LAKE NAME	DIVERSITY H'	EVENNESS J'	LAKE CODE BC	CL	CR	CN	DO	HR	HP	HY	PY	PN	PC	SY	WD	YG
BLUE CHALK	1.291	0.666	--- --- ---	3.305	1.701	2.892	2.999	1.521	1.701	1.205	3.092	2.179	2.374	0.806	1.813	3.565
CLEAR	1.101	0.582	0.007	--- --- ---	3.705	4.901	4.945	4.070	3.825	3.991	0.909	4.603	4.372	3.963	4.344	1.133
CRADLE	1.348	0.755	0.114	0.004	--- --- ---	2.118	2.268	1.115	0.436	1.461	3.504	0.890	1.479	1.739	0.713	3.949
CROSSON	1.420	0.715	0.014	0.001	**0.056**	--- --- ---	1.039	2.905	2.284	3.178	4.571	2.576	1.648	3.501	2.879	5.313
DELANO	1.432	0.724	0.012	0.001	0.043	**0.322**	--- --- ---	3.042	2.434	3.301	4.623	2.762	1.891	3.609	3.031	5.346
HAMER	1.328	0.678	**0.154**	0.002	**0.289**	0.014	0.011	--- --- ---	1.062	1.126	3.771	1.834	2.129	1.614	1.105	4.447
HARP	1.345	0.675	**0.114**	0.003	**0.674**	0.041	0.032	**0.312**	--- --- ---	1.454	3.600	1.075	1.614	1.764	0.555	4.098
HENEY	1.314	0.696	**0.253**	0.002	**0.170**	0.009	0.007	**0.284**	**0.172**	--- --- --	3.682	2.251	2.404	1.139	1.648	4.382
PEARCELEY	1.114	0.643	0.010	**0.614**	0.005	0.001	0.001	0.003	0.004	0.004	--- --- ---	4.238	4.104	3.633	4.004	1.437
PINCHER	1.360	0.735	0.050	0.001	**0.604**	0.025	0.018	**0.091**	**0.306**	0.044	0.002	--- --- ---	1.518	2.684	1.567	5.076
PLASTIC	1.386	0.770	0.035	0.001	**0.165**	**0.125**	**0.083**	**0.054**	**0.132**	0.034	0.002	**0.155**	--- --- ---	2.680	1.974	4.699
SKIDWAY	1.301	0.729	**0.558**	0.003	**0.107**	0.005	0.004	**0.132**	**0.103**	**0.279**	0.004	0.020	0.021	--- --- ---	2.103	4.389
WESTWARD	1.340	0.697	**0.094**	0.002	**0.503**	0.015	0.011	**0.293**	**0.595**	**0.125**	0.002	**0.143**	**0.072**	**0.057**	--- --- ---	4.780
YOUNG	1.082	0.554	0.005	**0.281**	0.003	0.000	0.000	0.001	0.002	0.001	**0.176**	0.001	0.001	0.001	0.001	--- --- ---

For a single comparison t=1.972 @ P=0.05; given 91 possible multiple comparisons the Bonferroni adjusted t value to maintain an overall probability of 0.05 si t>3.340

YG	**CL**	**PY**	**BC**	**SY**	**HY**	**HR**	**WD**	**HP**	**CR**	**PN**	**PC**	**CN**	**DO**
1.082	**1.101**	**1.114**	**1.291**	**1.301**	**1.314**	**1.328**	**1.340**	**1.345**	**1.348**	**1.360**	**1.386**	**1.420**	**1.432**

Table 12. Comparison of 1988 and 1989 fall survey data based on taxonomic richness.

TAXONOMIC NAME	BLUE CHALK		CLEAR		CRADLE		CROSSON		DELANO		HAMER		HARP		PINCHER		PLASTIC		SKIDWAY		WESTWARD		YOUNG	
	88	89	88	89	88	89	88	89	88	89	88	89	88	89	88	89	88	89	88	89	88	89	88	89
COELENTERATA														1										
TURBELLARIA (Tricladida)		1					1	1			1		1	1				1			1	1		1
NEMATODA	2	2	2	2		1	1	3	1	1		1		3	2		1	2		1	1	2	2	2
DORYLAIMIDA								1						1										
ENOPLIDA	1	1	1	1			1	1		1		1		1	1		1	1		1		1	1	1
MONONCHIDA	1	1	1	1		1		1	1					1	1			1			1	1	1	1
OLIGOCHAETA	4	6	4	3	2	2	4	9	3	3	6	2	5	7	4	2	6	3	3	2	6	8	5	4
HAPLOTAXIDA	2	4	1	1	1	1	2	7	1	1	4	1	2	4	2	1	3	1	1	1	4	5	2	1
LUMBRICULIDA	1	1	2	1	1	1	1	1	1	1	1		2	1	1	1	2	1	2	1	2	2	2	2
TUBIFICIDA	1	1	1	1			1	1	1	1	1	1	1	2	1		1	1				1	1	1
HIRUDINEA	1	1	2	1	2	2	3	2	2	3	2	1	2	1	2	2	3	1		1	6	1	4	2
GNATHOBDELLIDA									1												1			
PHARYNGOBDELLIDA	1		1	1	1	1	1			1	1		1	1	1	1				1	2	1	1	1
RHYNCHOBDELLIDA		1	1		1	1	2	2	1	2	1	1	1		1	1	3	1			3		3	1
ISOPODA																			1	1				
AMPHIPODA	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	1	2	2	2	2	2	2
DECAPODA	1				1																	1	1	1
HYDRACARINA							1	5		3	6	5		5			2		2				1	1
COLLEMBOLA								1																
EPHEMEROPTERA	7	7	5	5	5	4	6	6	5	5	5	4	6	5	2	2	3	2	4	3	5	5	7	8
ODONATA	8	8	9	12	8	7	12	8	11	10	12	14	9	8	6	8	10	7	11	8	4	4	7	6
PLECOPTERA	1	1											1								1		1	
HEMIPTERA		1	1		3	4	1	1	1	2		2	1		3	4			4	2	2	1		
MEGALOPTERA			1	1		1	2	1	1		1	1	1		1				2	1	1	1	1	1
NEUROPTERA												1												
TRICHOPTERA	9	10	10	14	14	8	11	14	12	12	10	12	10	13	8	13	11	10	13	10	8	11	9	12
LEPIDOPTERA	1		1	1	1							1	1	1		1	1		1		1	1	1	1
COLEOPTERA	5	5	3	3	1	3	3	5	3	8	2	3	4	3	2	6	1		5	3	4	3	5	8
DIPTERA TOTAL	41	40	37	31	32	26	31	35	39	41	37	38	34	44	28	29	35	33	42	26	46	40	35	34
DIPTERA:Ceratopogonidae	4	4	3	2	3	4	3	3	4	3	3	5	5	5	3	2	3	3	3	3	6	4	3	3
DIPTERA:Chironomidae	35	35	32	26	29	21	28	30	35	36	31	32	28	38	24	25	29	30	36	22	37	36	30	29
Subfam.-Podonominae	1		1				1																	
Subfam.-Tanypodinae	8	8	7	4	5	4	7	7	8	8	6	6	7	7	5	4	5	6	7	6	7	6	6	7
Subfam.-Diamesinae												1											1	1
Subfam.-Prodiamesinae	1		1	1	1								1	1							1	1	1	
Subfam.-Orthocladiinae	9	7	6	6	4	3	3	5	6	8	6	5	4	7	3	4	5	5	7	2	8	9	4	4
Subfam.-Chironominae	16	20	17	15	19	14	17	18	21	20	19	20	16	23	16	17	19	19	22	14	21	20	18	17
Tribe-Chironomini	12	15	14	12	16	11	14	13	18	17	16	17	13	18	12	14	15	16	19	11	16	15	14	13
Tribe-Tanytarsini	4	5	3	3	3	3	3	5	3	3	3	3	3	5	4	3	4	3	3	3	5	5	4	4
DIPTERA:Tabanidae								1		1	1	1		1	1	1			1	1			1	
DIPTERA:Tipulidae	1		1	1				1		1	1		1				2		1				1	1
DIPTERA:Culicidae																								
DIPTERA:Misc.	1	1	1	2							1					1			1		3			1
DIPTERA:Chaoboridae						1											1							
GASTROPODA	3	2	1	2	1		3	3	2	3	1	2	4	3	1	1	1	2			2	2	5	6
BASOMMATOPHORA	2	1	1		1		2	2	2	2	1	2	3	1	1	1	1	2			1	1	3	4
MESOGASTROPODA	1	1		2			1	1		1			1	2							1	1	2	2
BIVALVIA	1	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1
TOTAL GENERA	86	87	79	78	73	61	82	97	83	95	86	91	83	98	62	71	77	63	92	61	91	84	87	90

Table 13. Comparison of 1988 and 1989 fall survey data based on the number of individual organisms collected.

TAXONOMIC NAME	BLUE CHALK		CLEAR		CRADLE		CROSSON		DELANO		HAMER		HARP		PINCHER		PLASTIC		SKIDWAY		WESTWARD		YOUNG	
	88	89	88	89	88	89	88	89	88	89	88	89	88	89	88	89	88	89	88	89	88	89	88	89
COELENTERATA														1										
TURBELLARIA (Tricladida)		7					1	4			1		27	16				2			8	51		17
NEMATODA	14	19	5	4		2	2	15	1	3		1		13	3		1	3		1	2	47	4	10
DORYLAIMIDA								1						2										
ENOPLIDA	6	6	1	3			2	12		3		1		3	1		1	1		1		1	2	3
MONONCHIDA	8	13	4	1		2		2	1					8	2			2			2	46	2	7
OLIGOCHAETA	42	113	86	69	21	7	23	49	8	47	64	13	61	42	27	7	28	21	8	3	89	216	23	145
HAPLOTAXIDA	25	63	20	41	2	3	16	44	2	15	36	4	26	20	5	1	10	10	3	1	41	190	10	116
LUMBRICULIDA	10	15	37	23	19	4	4	1	4	2	18		25	11	21	6	17	9	5	2	48	19	10	29
TUBIFICIDA	7	35	29	5			3	4	2	30	10	9	10	11	1		1	2				7	3	
HIRUDINEA	1	2	3	2	5	7	8	2	3	18	2	1	3	1	4	11	8	1		1	16	1	9	4
GNATHOBDELLIDA									1												1			
PHARYNGOBDELLIDA	1		1	2	4	5	3			1	1		2	1	3	9				1	4	1	3	3
RHYNCHOBDELLIDA		2	2		1	2	5	2	2	17	1	1	1		1	2	8	1			11		6	1
ISOPODA																			115	24				
AMPHIPODA	1341	914	1056	2486	1055	224	1811	814	683	705	3617	1531	2095	817	448	733	343	106	311	109	1312	620	1980	3434
DECAPODA	1				2																	1	1	1
HYDRACARINA							1	25		4	41	16		10			2		5				1	1
COLLEMBOLA								3																
EPHEMEROPTERA	598	298	541	584	355	169	807	762	768	858	1672	1552	324	147	451	930	263	49	1582	444	417	774	118	270
ODONATA	83	47	55	85	26	59	324	148	136	129	314	389	346	122	31	546	118	38	264	179	31	19	67	200
PLECOPTERA	1	1											1								2		1	
HEMIPTERA		1	3		4	18	1	1	1	3		22	1		6	93			26	5	7	6		
MEGALOPTERA			25	19		1	7	6	1		2	15	3		1				12	2	1	7	1	3
NEUROPTERA												1												
TRICHOPTERA	76	64	90	275	36	47	142	103	38	132	406	420	77	57	71	608	113	39	496	156	38	41	52	128
LEPIDOPTERA	2		3	15	2							1	4	2		1	1		4		3	12	2	7
COLEOPTERA	78	109	25	19	9	9	112	328	18	175	4	17	29	85	8	29	1		27	2	25	83	11	242
DIPTERA TOTAL	1305	1187	872	1455	1646	682	1627	3084	499	2450	1521	2148	1044	1180	1652	5645	2225	1544	6041	4451	1163	3728	649	2647
DIPTERA:Ceratopogonidae	62	53	80	94	19	39	35	60	14	141	389	472	59	107	57	275	70	79	414	269	124	421	21	104
DIPTERA:Chironomidae	1232	1131	790	1358	1627	642	1592	3022	485	2304	1129	1674	984	1071	1594	5365	2151	1465	5620	4181	1024	3307	625	2541
Subfam.-Podonominae	1		1				1																	
Subfam.-Tanypodinae	544	634	151	181	222	74	729	981	218	647	475	512	456	230	445	695	482	358	956	630	262	191	327	867
Subfam.-Diamesinae																							3	1
Subfam.-Prodiamesinae	3		18	6	1								24	29							5	4	3	
Subfam.-Orthocladiinae	143	67	54	143	140	110	236	608	26	119	319	176	69	129	217	1183	381	353	575	398	41	113	5	185
Subfam.-Chironominae	541	430	566	1028	1264	458	626	1433	241	1538	335	986	435	683	932	3487	1288	754	4089	3153	716	2999	287	1488
Tribe-Chironomini	346	198	494	823	882	346	351	666	175	1064	306	919	293	441	698	2341	885	495	3822	2705	376	1564	231	522
Tribe-Tanytarsini	195	232	72	205	382	112	275	767	66	474	29	67	142	242	234	1146	403	259	267	448	340	1435	56	966
DIPTERA:Tabanidae								1		2	1	2		2	1	4			1	1			1	
DIPTERA:Tipulidae	8		1	1				1		3	1		1				3		3				2	1
DIPTERA:Culicidae																								
DIPTERA:Misc.	3	3	1	2							1					1	1		2		7			1
DIPTERA-Indent./terrestrial forms																			1		8			
DIPTERA:Chaoboridae						1																		
GASTROPODA	3	3	2	12	3		47	65	2	184	9	8	92	231	2	4	10	11			5	16	96	156
BASOMMATOPHORA	2	2	2	12	3		5	45	2	81	9	8	8	3	2	4	10	11			3	6	22	24
MESOGASTROPODA	1	1					42	20		103			84	228							2	10	74	132
BIVALVIA	8	20	85	33	26	12	4	14	31	49	270	82	228	97	115	121	193	192	6	58	217	566	231	56
TOTAL INDIVIDUALS	3553	2785	2851	5058	3190	1237	4915	5423	2189	4757	7923	6217	4335	2821	2819	8728	3306	2006	8896	5435	3336	6188	3246	7321

Table 14. Listing of the species found in only one lake in both 1988 and 1989.

MOE IDCODE	SPECIES	LAKE	FALL 1988	LAKE	FALL 1989
	OLIGOCHAETA				
317	Nais simplex	HAMER	1	WESTWARD	1
327	Uncinais uncinata	WESTWARD	2	CROSSON	2
	ISOPODA				
502	Caecidotea forbesi	SKIDWAY	115	SKIDWAY	24
	AMPHIPODA				
602	Crangonyx gracilis	BLUE CHALK	3	BLUE CHALK	1
	HYDRACARINA				
810	Arrenurus (Mega.) megalurus	HAMER	1	HARP	1
832	Arrenurus (Mega.) bergei	HAMER	1	HAMER	1
834	Arrenurus (Mega.) elevatus	YOUNG	1	YOUNG	1
	EPHEMEROPTERA				
1024	Siphloplecton basale	HARP	1	YOUNG	5
	ODONATA				
1105	Argia violacea	HAMER	9	HAMER	5
	HEMIPTERA				
1316	Notonecta (Paranecta) insulata	PINCHER	3	PINCHER	47
1328	Sigara (Phaeo.) macropala	PINCHER	2	PINCHER	20
1330	Sigara (Pileo.) douglasensis	HARP	1	CRADLE	2
	TRICOPTERA				
1603	Agrypnia improba	SKIDWAY	1	PINCHER	2
1645	Phryganea sp	SKIDWAY	1	HAMER	1
	COLEOPTERA				
1850	Coptotomus longulus	PINCHER	1	PINCHER	2
	DIPTERA: CERATOPOGONIDAE				
2142	Palpomyia sp.1 tibialis gr.	CRADLE	1	HAMER	2
	DIPTERA: Sub-family-Diamesinae				
2501	Potthastia sp.1 longimana gr.	YOUNG	3	YOUNG	1
	DIPTERA: Sub-family-Orthocladinae				
2719	Cricotopus (s.str.) sp. bicinctus gr	SKIDWAY	4	HAMER	1
2752	Nanocladius (s.str.) nr. minimus	HAMER	2	DELANO	1
	DIPTERA: Tipulidae				
3211	Pedicia sp.	SKIDWAY	3	CLEAR	1
	GASTROPODA				
3503	Campeloma decisum	YOUNG	4	YOUNG	1
3506	Physella (s.str.) gyrina	YOUNG	3	YOUNG	4

Table 15. Listing of the species found
in all study lakes in 1988 and 1989.

MOE IDCODE	SPECIES
600	**AMPHIPODA**
606	Hyalella azteca
1000	**EPHEMEROPTERA**
1012	Eurylophella temporalis
1032	Leptophlebia cupida
1100	**ODONATA**
1128	Gomphus exilis
1600	**TRICOPTERA**
1658	Pycnopsyche sp.
2100	**DIPTERA Ceratopogonidae**
2400	**Subfam. Tanypodinae**
2426	Procladius (Holotanypus) sp
2700	**Subfam.-Orthocladiinae**
2774	Psectrocladius (s.str.) litofilus
2800	**Subfam.-Chironominae**
2900	**Tribe-Chironomini**
2914	Dicrotendipes modestus
2918	Dicrotendipes tritomus
2928	Microtendipes pedellus
2986	Tribelos jucundum
3000	**Tribe-Tanytarsini**
3002	Cladotanytarsus sp
3016	Tanytarsus/Micropsectra spp
3600	**BIVALVIA**
3602	Pisidium casertanum

Table 16. Spearman rank correlations between each of the 12 lakes based on the spatial (above the diagonal) and the temporal (below diagonal) variance components for the 24 major taxonomic groups (P=0.05 @ r=0.425, P=0.01 @ r=0.544, P=0.001 @ r=0.667).

	Lake code											
LAKE NAME	**BC**	**CL**	**CN**	**CR**	**DO**	**HP**	**HR**	**PC**	**PN**	**SY**	**WD**	**YG**
BLUE CHALK	-	0.003	0.084	0.394	-0.214	-0.241	0.282	0.070	-0.026	0.008	0.005	0.042
CLEAR	0.108	-	0.148	0.333	0.046	0.050	0.105	0.033	0.383	0.174	0.044	0.090
CROSSON	-0.098	0.261	-	-0.091	0.322	0.098	0.528	0.181	0.244	-0.294	0.433	0.277
CRADLE	0.234	0.483	-0.060	-	0.241	-0.186	0.091	-0.006	0.335	0.228	0.222	0.282
DELANO	-0.024	0.015	0.191	0.099	-	-0.159	0.126	0.010	0.326	-0.112	0.311	0.255
HARP	0.181	-0.212	0.269	-0.004	0.240	-	-0.085	0.007	0.087	0.144	0.092	0.114
HAMER	0.332	-0.034	0.110	-0.146	-0.075	-0.064	-	0.022	0.272	0.015	0.371	0.195
PLASTIC	0.229	0.015	0.011	0.122	0.261	0.330	-0.225	-	0.289	0.010	0.147	0.195
PINCHER	0.035	-0.029	0.049	0.005	0.359	0.014	0.190	0.075	-	0.212	0.231	0.369
SKIDWAY	0.293	0.137	-0.301	0.113	0.240	-0.122	-0.288	0.033	0.342	-	0.067	0.205
WESTWARD	0.173	-0.048	0.187	0.050	-0.053	0.232	0.187	0.165	0.204	-0.071	-	0.056
YOUNG	-0.184	0.039	-0.099	0.057	-0.227	-0.138	-0.138	-0.092	-0.055	0.143	-0.182	-

Table 17. Spatial and temporal variation in the ordination axes and 3 univariate metrics.

PARAMETER	LAKE EFFECTS (%)	YEAR EFFECTS (%)	TOTAL VARIANCE
NUMBER OF INDIVIDUALS	52.7	0.02	52.7
NUMBER OF TAXA	57.7	0.15	57.9
H' DIVERSITY	78.9	0.13	79.0
PRESENCE/ABSENCE			
CA1	72.2	0.16	74.2
CA2	30.9	1.6	32.5
ABUNDANCE			
CA1	78.4	1.2	79.6
CA2	82.8	0.37	83.2

Table 18: Correlations between the 7 biological metrics and the physical and chemical data from 1989 (N = 14).

PEARSON'S PRODUCT-MOMENT CORRELATIONS:

	# of			P/A		ABUNDANCE	
	Taxa	# OF INDIV.	H'	CA1	CA2	CA1	CA2
ALKTI(GRAN) uq.L	**0.555**	0.048	-0.158	0.252	-0.369	0.330	0.391
ALKT(TFE) uq.L	**0.540**	0.036	-0.170	0.254	-0.358	0.332	0.379
AL ug.L	0.198	0.381	0.271	-0.119	0.049	-0.154	-0.083
CA mg.L	**0.782**	0.107	0.020	0.428	-0.453	0.504	0.397
CL mg.L	0.435	0.036	0.151	-0.105	-0.507	-0.034	0.415
COND25 uS.cm	**0.830**	0.172	0.108	0.219	-0.461	0.293	0.425
DIC mg.L	**0.700**	0.271	0.092	0.243	-0.423	0.334	0.412
DOC mg.L	0.464	0.304	0.278	-0.036	-0.274	-0.005	0.260
FE ug.L	0.022	0.202	0.350	-0.439	-0.133	-0.397	0.261
K mg.L	**0.556**	0.418	-0.209	-0.065	**-0.592**	-0.019	0.531
MG mg.L	**0.895**	0.098	0.246	0.086	-0.364	0.174	0.414
MN mg.L	-0.291	0.226	0.163	-0.219	0.155	-0.258	-0.151
NA mg.L	**0.700**	0.090	0.102	-0.187	-0.519	-0.106	0.509
NH4 ug.L	-0.190	0.348	0.128	-0.121	-0.021	-0.148	-0.032
NO3 ug.L	**0.607**	**0.603**	0.042	0.077	-0.018	0.084	-0.076
TKN ug.L	0.312	0.366	0.302	-0.170	-0.185	-0.150	0.209
pH	0.369	-0.209	-0.094	0.192	-0.271	0.272	0.313
SO4 mg.L	**0.664**	0.049	0.233	0.221	-0.173	0.243	0.165
Total phosphorus (ug.L)	**0.555**	0.223	0.411	-0.119	-0.075	-0.054	0.180
Area (ha)	0.371	0.308	**-0.607**	0.305	-0.135	0.323	0.094
Volume (10E+05 m3)	0.383	0.241	-0.423	0.275	-0.159	0.332	0.101
Maximum Depth (m)	0.296	-0.127	0.044	0.145	-0.010	0.220	-0.007
Shoreline Length (km)	0.262	0.454	-0.525	0.205	0.060	0.165	-0.117

SPEARMAN'S RANK CORRELATIONS:

	# of			P/A		ABUNDANCE	
	Taxa	# OF INDIV.	H'	CA1	CA2	CA1	CA2
ALKTI(GRAN) uq.L	**0.596**	0.011	-0.070	0.293	-0.284	0.297	0.380
ALKT(TFE) uq.L	**0.620**	0.013	-0.037	0.218	-0.207	0.224	0.339
AL ug.L	0.160	0.341	0.420	**-0.590**	-0.077	**-0.596**	0.011
CA mg.L	**0.825**	0.166	-0.089	0.422	-0.476	0.427	0.462
CL mg.L	0.345	0.013	-0.084	-0.191	**-0.603**	-0.178	**0.550**
COND25 uS.cm	**0.886**	0.165	0.035	0.290	-0.446	0.297	0.437
DIC mg.L	**0.716**	0.403	-0.067	0.330	-0.427	0.333	0.410
DOC mg.L	**0.554**	0.382	0.259	-0.385	-0.404	-0.386	0.364
FE ug.L	0.103	0.209	**0.583**	-0.436	0.037	-0.429	-0.007
K mg.L	**0.542**	**0.544**	-0.305	-0.066	**-0.749**	-0.073	**0.676**
MG mg.L	0.908	0.152	0.095	0.246	-0.358	0.253	0.437
MN mg.L	-0.244	0.229	0.132	-0.262	0.152	-0.271	-0.040
NA mg.L	**0.771**	0.367	-0.035	-0.007	**-0.543**	-0.002	0.468
NH4 ug.L	-0.461	0.179	-0.040	0.044	0.185	0.035	-0.245
NO3 ug.L	**0.684**	**0.640**	-0.048	0.114	-0.279	0.103	0.178
TKN ug.L	0.367	0.468	0.231	-0.383	-0.279	-0.385	0.240
pH	0.424	-0.178	-0.185	0.317	-0.165	0.323	0.305
SO4 mg.L	**0.628**	-0.004	0.259	0.061	-0.300	0.070	0.311
Total phosphorus (ug.L)	**0.552**	0.266	0.273	-0.059	-0.319	-0.051	0.266
Area (ha)	0.437	0.336	-0.352	0.326	-0.108	0.319	0.068
Volume (10E+05 m3)	0.323	0.200	-0.110	0.372	0.200	0.376	-0.187
Maximum Depth (m)	0.363	-0.108	0.158	0.251	0.138	0.257	-0.029
Shoreline Length (km)	0.257	0.459	-0.352	0.242	-0.081	0.244	-0.007

rs = 0.538 @ P = 0.05 rs = 0.802 @ P = 0.001
r = 0.532 @ P = 0.05 r = 0.780 @ P = 0.001

Table 19 : Correlations between the 7 biological metrics and the physical and chemical data from 1988 (N = 12).

PEARSON'S PRODUCT-MOMENT CORRELATIONS:

	# of	# OF INDIV.	H'	P/A		ABUNDANCE	
	Taxa			CA1	CA2	CA1	CA2
ALKTI(GRAN) uq.L	0.309	-0.313	-0.591	0.748	0.448	0.714	0.318
ALKT(TFE) uq.L	0.258	-0.367	-0.601	0.785	0.413	0.753	0.292
AL ug.L	0.201	0.789	-0.092	-0.674	-0.283	-0.731	-0.327
CA mg.L	0.234	-0.255	-0.762	0.644	0.070	0.579	-0.097
CL mg.L	0.301	0.564	-0.428	-0.052	-0.107	-0.106	-0.281
COND25 uS.cm	0.215	-0.086	-0.747	0.510	0.100	0.423	-0.052
DIC mg.L	0.328	-0.144	-0.504	0.517	0.438	0.467	0.302
DOC mg.L	0.324	0.610	-0.424	-0.378	-0.216	-0.459	-0.321
FE ug.L	-0.096	-0.140	-0.154	0.042	0.020	0.054	0.228
K mg.L	0.274	0.029	-0.853	0.529	0.176	0.440	0.091
MG mg.L	0.273	-0.245	-0.606	0.567	0.323	0.488	0.188
MN mg.L	-0.064	-0.382	-0.349	0.386	0.192	0.404	0.331
NA mg.L	0.291	0.123	-0.596	0.442	0.420	0.359	0.275
NH4 ug.L	0.092	0.529	-0.095	-0.402	-0.415	-0.426	-0.531
NO3 ug.L	0.431	0.415	-0.146	-0.446	-0.131	-0.506	-0.233
TKN ug.L	0.211	0.635	-0.365	-0.477	-0.289	-0.549	-0.336
pH	0.210	-0.568	-0.491	0.902	0.358	0.901	0.243
SO4 mg.L	-0.189	-0.522	-0.273	0.448	-0.123	0.413	-0.149
Total phosphorus (ug.L)	0.353	0.416	-0.551	-0.156	-0.004	-0.240	-0.103
Area (ha)	0.099	-0.318	-0.476	0.750	0.234	0.737	0.179
Volume (10E+05 m3)	0.231	-0.380	-0.395	0.752	0.244	0.758	0.189
Maximum Depth (m)	0.021	-0.520	-0.195	0.671	0.084	0.691	0.070
Shoreline Length (km)	-0.280	-0.200	-0.247	0.481	-0.015	0.466	-0.005

SPEARMAN'S RANK CORRELATIONS:

	# of	# OF INDIV.	H'	P/A		ABUNDANCE	
	Taxa			CA1	CA2	CA1	CA2
ALKTI(GRAN) uq.L	0.385	-0.133	-0.622	0.706	0.441	0.734	0.343
ALKT(TFE) uq.L	0.291	-0.196	-0.601	0.762	0.406	0.783	0.322
AL ug.L	0.130	0.413	0.084	-0.685	-0.133	-0.720	-0.161
CA mg.L	0.267	-0.198	-0.744	0.568	0.317	0.582	0.222
CL mg.L	0.219	0.531	-0.131	0.076	0.197	0.116	0.080
COND25 uS.cm	0.211	-0.109	-0.715	0.462	0.266	0.480	0.144
DIC mg.L	0.526	0.028	-0.490	0.466	0.539	0.466	0.424
DOC mg.L	0.487	0.432	-0.365	-0.358	0.246	-0.372	0.133
FE ug.L	-0.189	-0.182	0.039	-0.144	0.000	-0.165	0.186
K mg.L	0.340	-0.137	-0.735	0.531	0.236	0.492	0.155
MG mg.L	0.326	-0.217	-0.746	0.585	0.389	0.595	0.273
MN mg.L	-0.261	-0.553	-0.109	0.221	0.172	0.235	0.333
NA mg.L	0.455	0.203	-0.552	0.357	0.566	0.343	0.469
NH4 ug.L	0.179	0.322	0.175	-0.336	-0.273	-0.357	-0.343
NO3 ug.L	0.613	0.288	-0.042	-0.453	-0.021	-0.475	-0.158
TKN ug.L	0.279	0.249	-0.329	-0.459	0.088	-0.501	0.046
pH	0.196	-0.238	-0.476	0.874	0.455	0.902	0.399
SO4 mg.L	-0.226	-0.338	-0.394	0.239	0.007	0.239	0.014
Total phosphorus (ug.L)	0.326	0.343	-0.566	-0.203	0.168	-0.196	0.084
Area (ha)	0.126	-0.112	-0.266	0.776	0.266	0.762	0.287
Volume (10E+05 m3)	0.018	-0.238	-0.140	0.846	0.161	0.839	0.196
Maximum Depth (m)	-0.067	-0.252	-0.252	0.741	0.147	0.748	0.133
Shoreline Length (km)	-0.196	-0.154	-0.119	0.545	0.084	0.504	0.182

rs = 0.587 @ P = 0.05 rs = 0.846 @ P = 0.001
r = 0.576 @ P = 0.05 r = 0.823 @ P = 0.001

Figure 1. Map illustrating the locations of the study lakes in south-central Ontario.

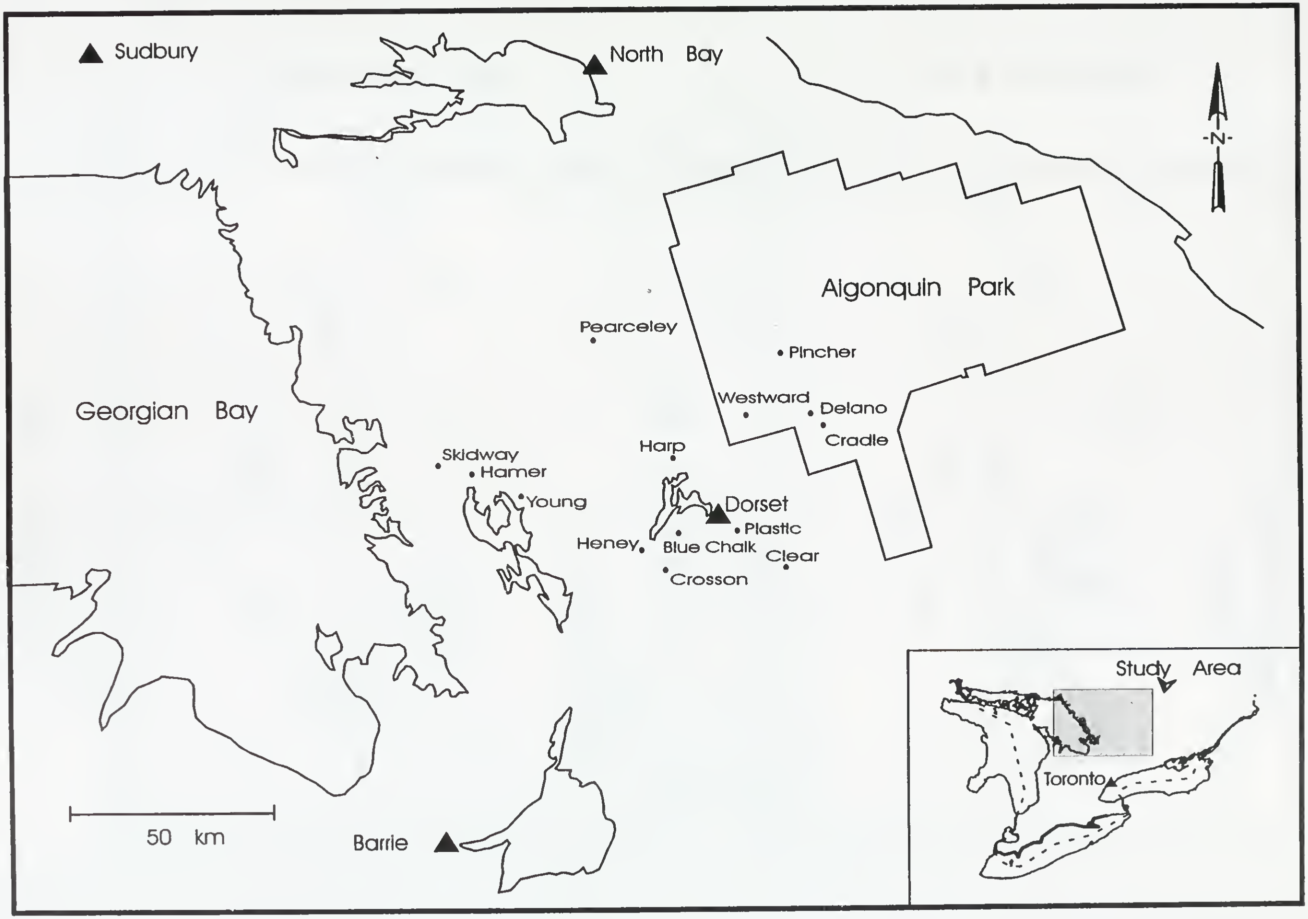


Figure 2. Z-score plots comparing taxonomic richness and abundance for 14 lakes surveyed in the fall 1989

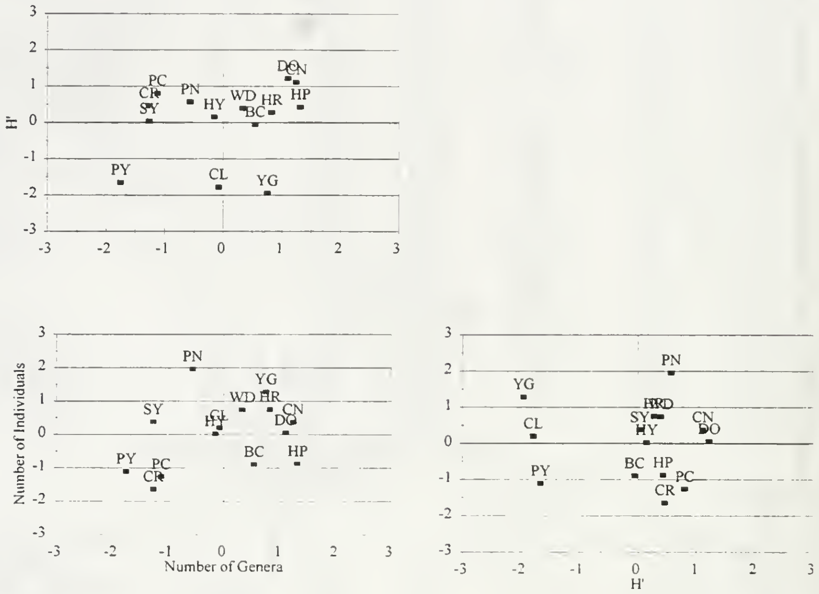
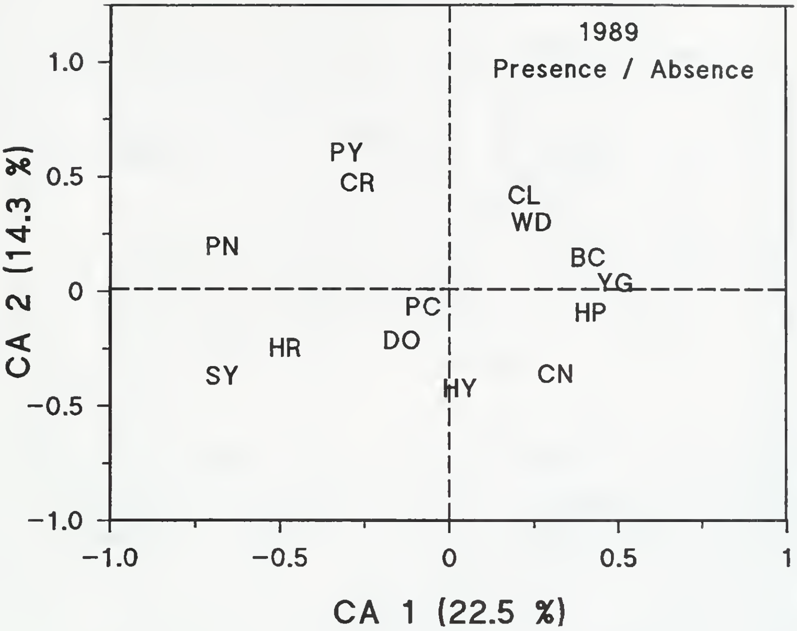


Figure 3. Corresponence analysis plots for the presence/absence data and the log (x + 1) abundance data for the 14 lakes in 1989.



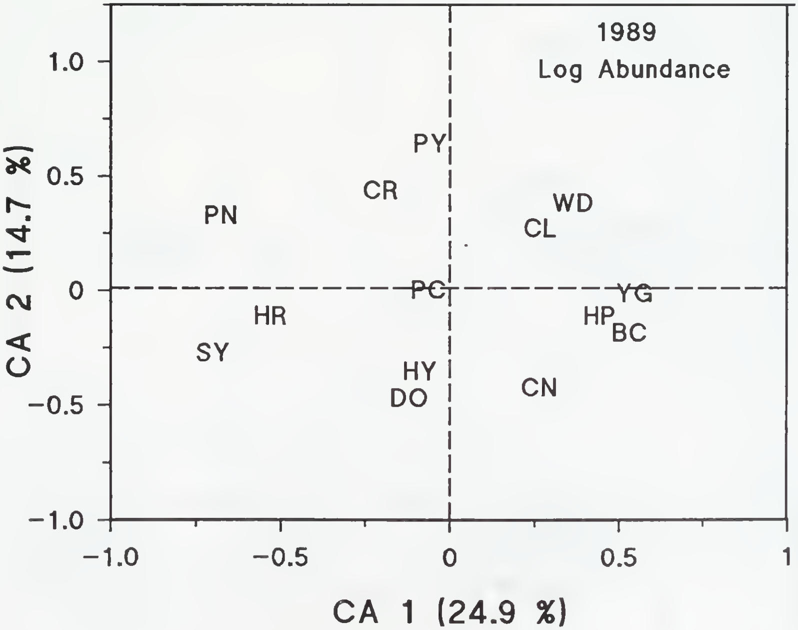


Figure 4. Z-score plot of the taxonomic richness and abundance data comparing the 1988 data with the 1989 data.

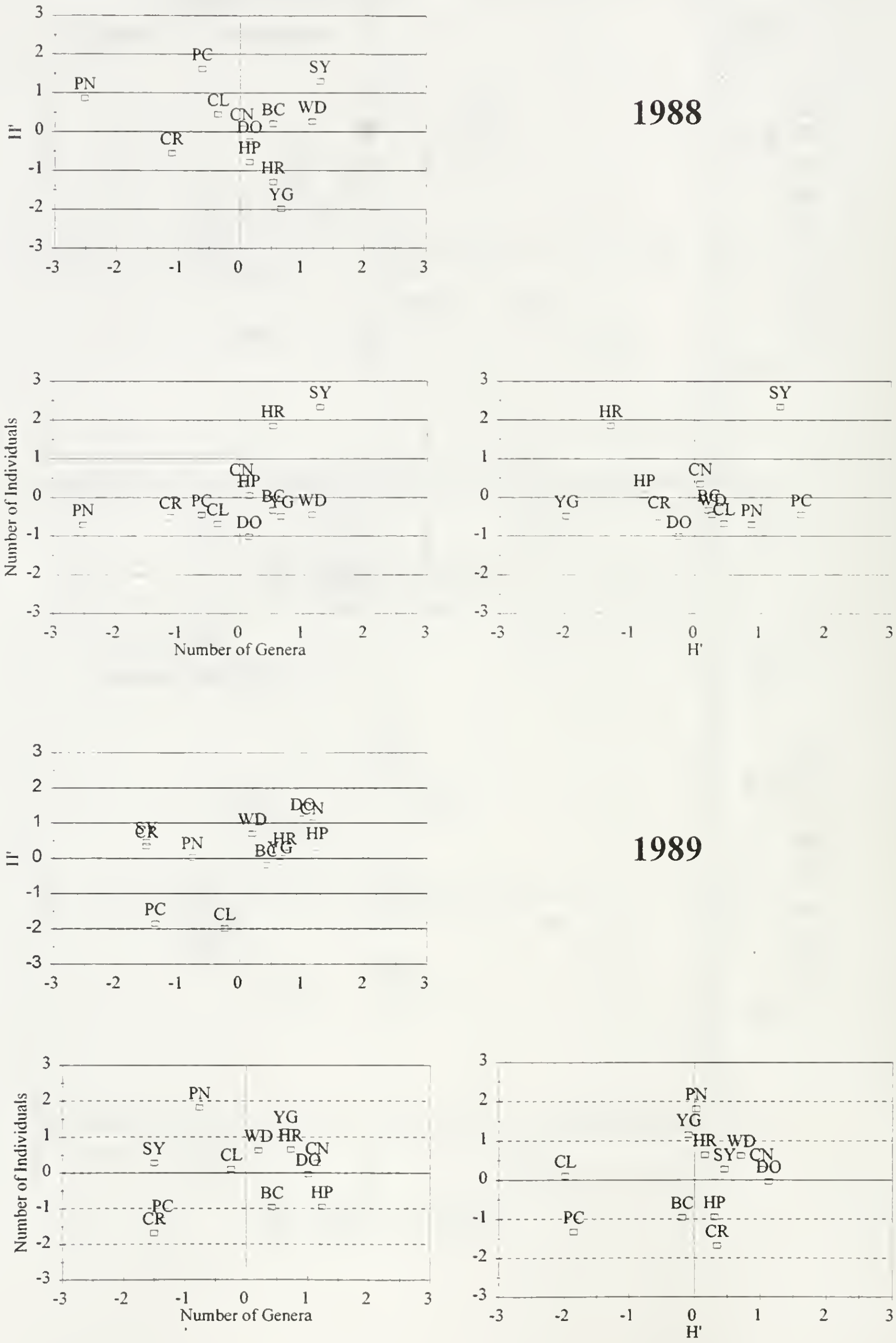
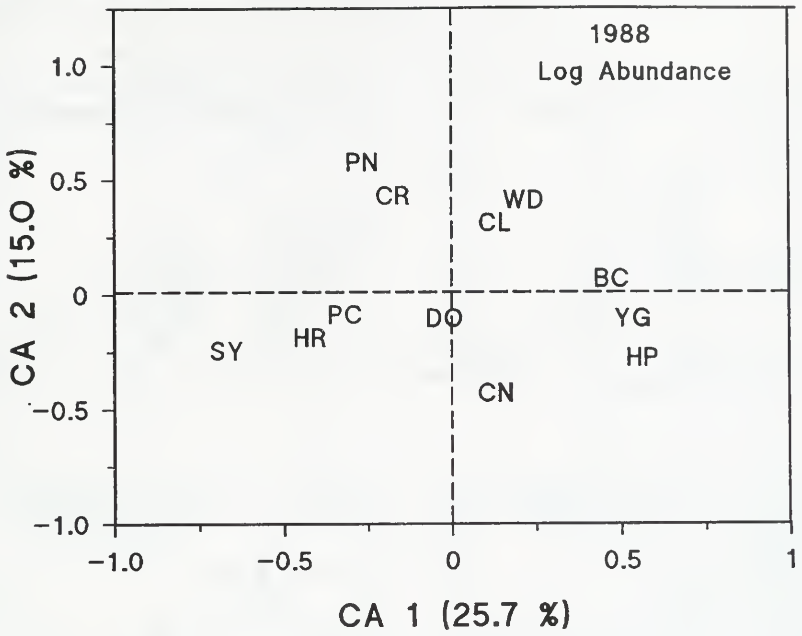


Figure 5. CA ordinations of the log (x + 1) abundance data comparing the 1988 and 1989 results.



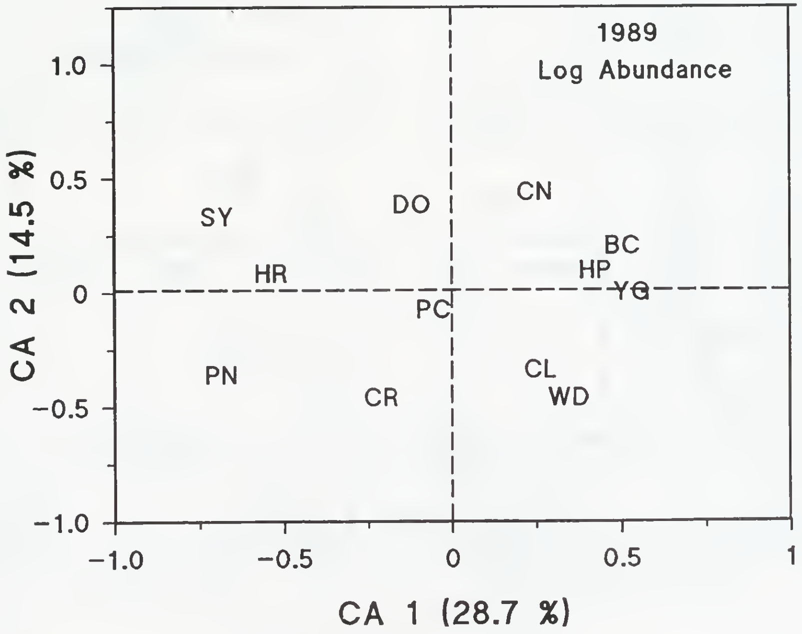


Figure 6. CA ordinations of the presence/absence data comparing the 1988 and 1989 results.

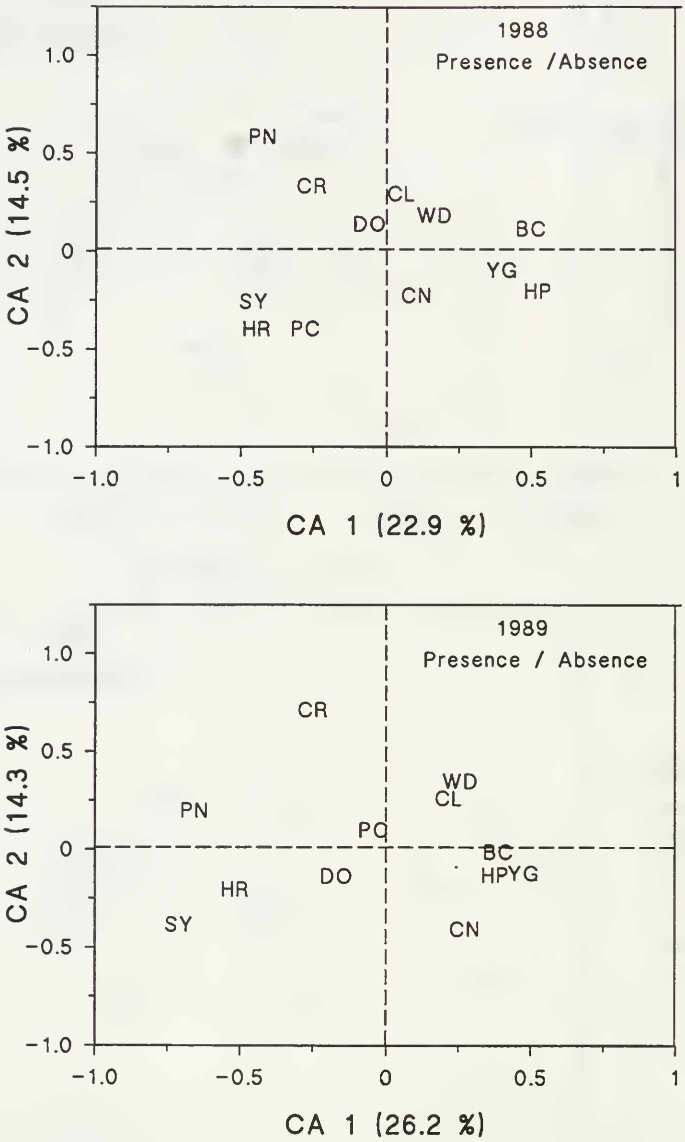


Figure 7. Spatial and temporal variance component plots for the major taxonomic groups. Two-letter codes refer to the lake names given in Table 1.

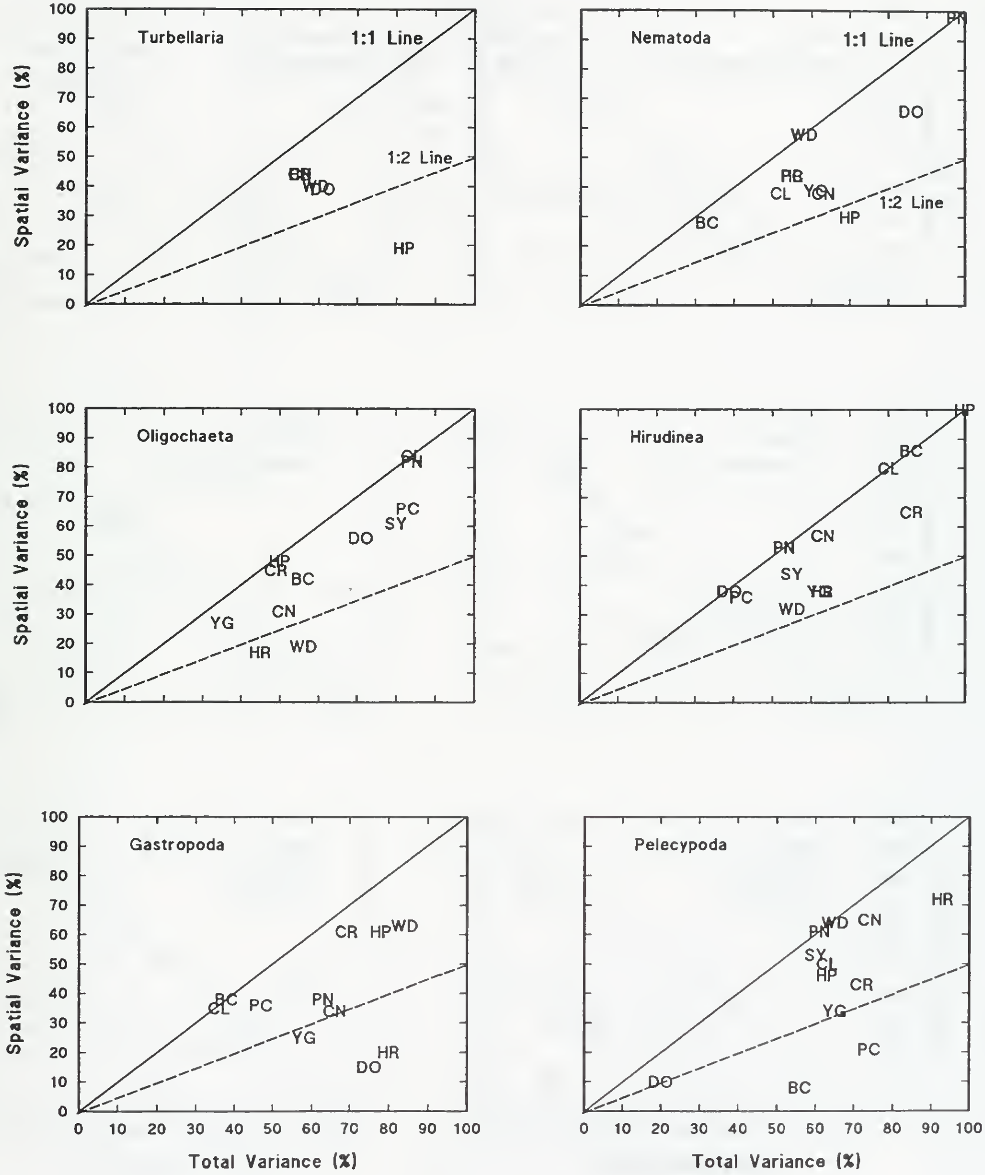


Figure 7. Continued.

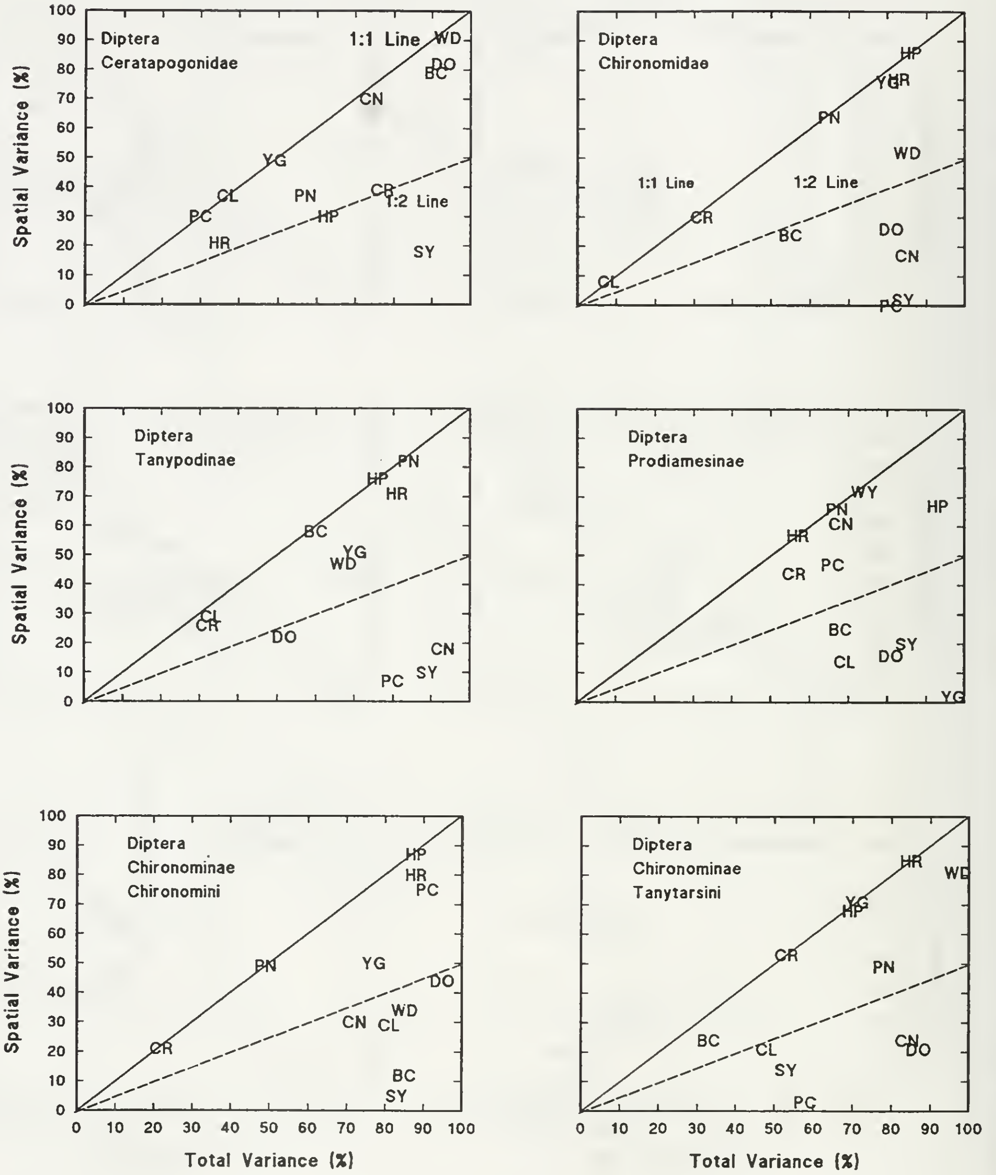


Figure 7. Continued.

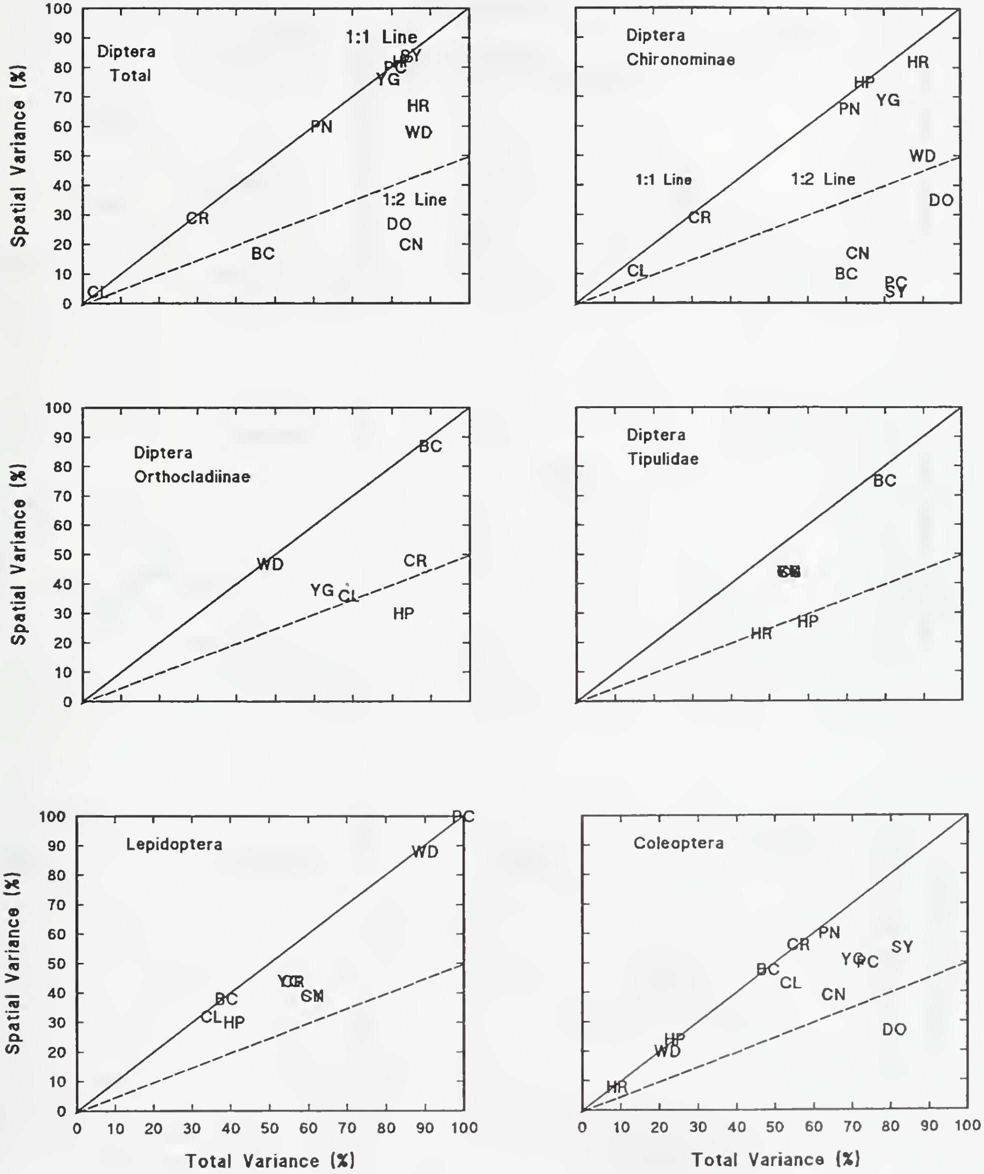
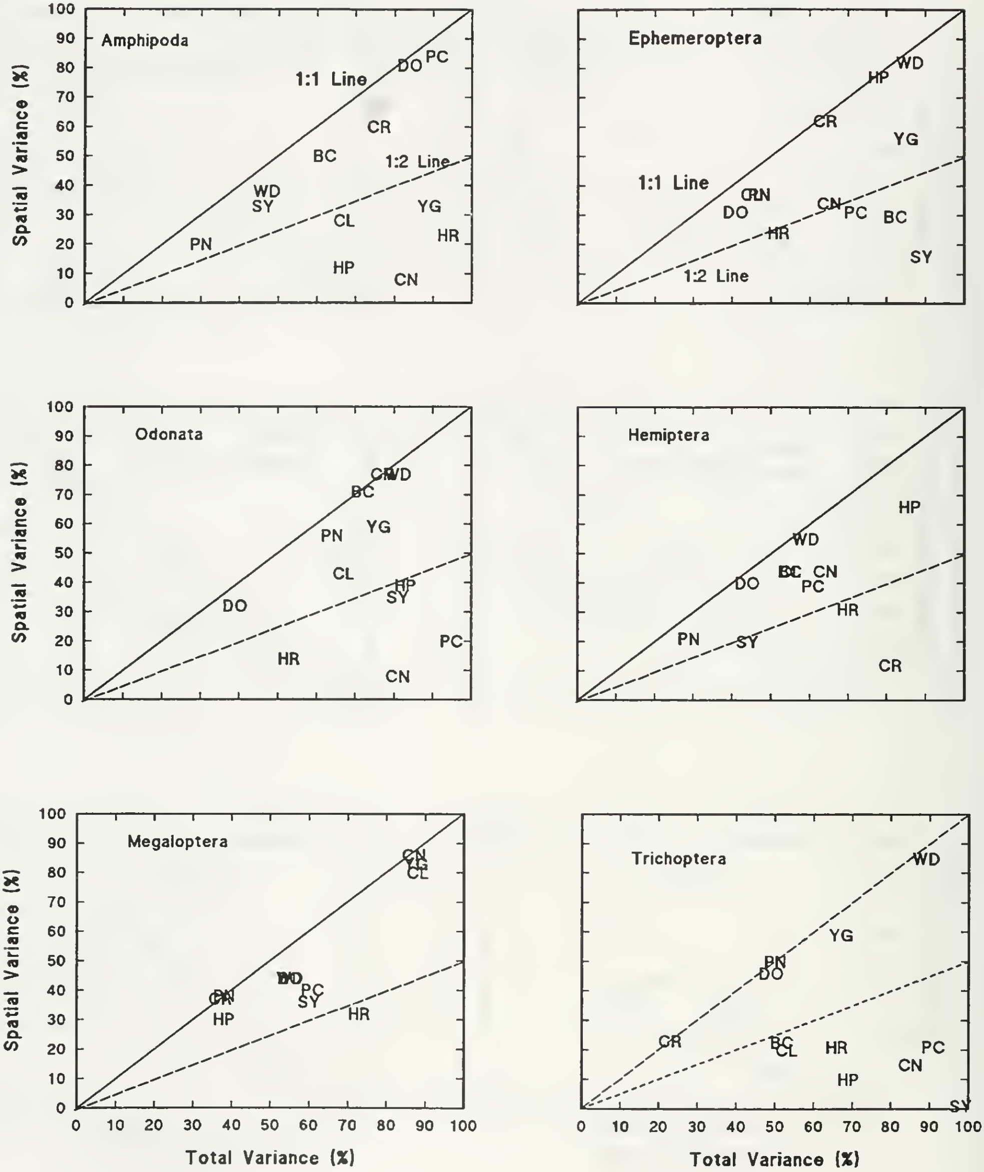


Figure 7. Continued.



APPENDIX 1

LRTAP RATIONALE AND SAMPLING PROTOCOLS

As part of the overall biological effects monitoring program, the periodic survey of lake benthos is intended to give a reliable estimate of community structure for the common, but sensitive, benthic and semi-benthic macroinvertebrates and to determine the response through time of these communities to changing environmental conditions. The emphasis has been placed on sampling three major groups: Ephemeroptera, Trichoptera and Crustacea, partly due to the established sensitivity of these groups to a variety of contaminants and partly because these groups are important links in the food chain, are widely represented across the country and easily sampled by a variety of techniques.

Four principal sampling activities are used to characterize the benthic fauna of each lake. First, representative segments of shoreline and the adjacent shallow littoral areas are sampled with sweep nets and by hand to collect Ephemeroptera, Trichoptera, Odonata, Amphipoda, Gastropoda and other miscellaneous shallow water forms. Second, dredge samples are taken from the deeper portions of the lake to collect Amphipoda, Mollusca and Insecta from the sub-littoral. Third, baited wire traps, set out overnight, are used to capture Decapoda and Hirudinea. And fourth, taxa such as *Mysis* or *Chaoborus*, which are benthic during the day, but planktonic at night, are captured by a series of night time, vertical net tows.

The methods presented here have been tested at the Experimental Lakes Area, northwestern Ontario and are thought to be generally applicable to most lacustrine habitats. Following an initial year of testing and evaluation, revisions or additions to the protocol may be necessary.

Lake Selection

The "lake benthos" portion of the protocol is based on the assumption that lakes have been selected for their general usefulness in biomonitoring, according to the criteria agreed upon at the May, 1986 Winnipeg Workshop.

Survey Timing

It is difficult to base the characterization of any habitat on the presence or absence of the early life stages of most benthic invertebrates. Young are difficult to collect because they often choose refuges that are hard to sample effectively. Relative to the adult forms, young are small, fragile and often escape all but the finest mesh samplers, or are damaged beyond recognition. In addition, young are often morphologically different from the adults and generally of little use to the taxonomists. To ensure maximum benefit from the work, therefore, it is important that the benthic surveys be conducted at a time of year when the maximum number of species are present in the adult form or late larval stages.

For crustacean invertebrates, this time is in the spring or early summer. For the Trichoptera, Ephemeroptera and Odonata, adult insect emergence usually begins within a month or two after ice-out and continues throughout the summer, depending on the species present. While the taxonomy of insects is primarily based on the adults, the latter three groups are more easily sampled in their aquatic forms as larvae or nymphs and in most cases are taxonomically distinct enough to provide genus or species level identifications. Larval identifications of the Chironomidae or the Chaoboridae are more difficult without associates adult material. However, the period of chironomid emergence is protracted, due to the variety of species present in most habitats, so only a few adult forms could be sampled during a "one short" survey. Adult Diptera should, therefore, be overlooked and preference given to larval sampling. As with the other groups, the best time to do this is in the spring, prior to the major period of adult insect emergence. The resultant loss of taxonomic information for the chironomids and chaoborids is probably not critical since these insects generally appear to be more resistant to various forms of pollution than other benthic taxa.

Mollusks and leeches can be effectively sampled at any time of the year but, in the case of decapoda crustaceans, there are some advantages to sampling either in the spring or late fall. Crayfish overwinter in the intermoult stage and females lay eggs in the spring, so at this time of year, collections can be used to evaluate the maximum degree of exoskeleton hardening and breeding success. By late fall young-of-the-year crayfish can be captured (though sometimes with difficulty) to determine recruitment success.

Although the optimum time of year to sample each system will ultimately depend upon a consideration of the various life histories of its fauna, it seems that, as a general rule, it is best to sample in the spring.

Sampling Methods

a) Optimizing Sampling Effort

The sampling protocol outlined below is intended to be used as a guideline. The methodologies have been chosen for their general usefulness, but they are quite specific in their detail. Although it is recognized that they may not be universally applicable, each of the methods should be tried.

The lack of a precise definition of the amount of sampling effort required to yield a representative sample of the fauna in each habitat, is one area of critical weakness in the protocol. This is particularly true of the section on shoreline and shallow littoral sampling, where sampling effort has been defined as the amount of time spent performing each sampling activity. The shoreline and shallow water areas of most lakes are the most productive and diverse habitats and often the most difficult to sample effectively. This area also contains the greatest number of sensitive species, largely because the animals are exposed to the highest fluxes of pollutants entering the lake. It is important, therefore, to take great care when choosing the sampling sites and to obtain some measure of sampling efficiency.

Gear type, physical conditions of the area and the skill of individual workers are all factors which will affect collecting efficiency. Two procedures are recommended for the first year of sampling (and periodically thereafter) to maximize the specimen return and minimize sampling effort:

i) An experienced biologist should make the decisions about where to sample and how it should be done (assuming that modifications to standard procedures are necessary). The biologist should oversee the sampling operation, train assistants and eventually ensure program continuity from year to year.

ii) Using, as a guideline, the sampling times suggested in the "shore sampling" section of the protocol, the biologist should make three separate sets of collections at each site, then subsequently determine an optimum sampling strategy. This optimum should be taken as the sampling time necessary to obtain more than 90% of the maximum number of species found at any location. Similarly, the number of dredge and net tow samples required should also be evaluated.

b) Shore and Shallow Littoral Collections

i) Purpose

Many important indicator species occupy the shallow littoral habitat. Principally, one should expect to collect representatives of the Ephemeroptera, Trichoptera, Odonata, Decapoda, Amphipoda, Diptera and Coleoptera. The goal is to sample as many different areas as possible but, at the same time, avoid collecting large volumes of the vegetation, mud, allochthonous material, rocks and gravel that characterize this habitat. In addition, it is important to minimize habitat destruction during the sampling process.

ii) Site Selection and Documentation

Five shoreline sampling sites should be chosen for each lake. These locations should include both average and extreme habitat types, but should be chosen with a view to a representative characterization of the lake. Preference should be given to areas which afford good cover or great physical, within-site diversity. It is desirable that sites be chosen on both the windward and leeward shores. Areas within the immediate influence of inflowing rivers or streams should be avoided, unless there is some overriding reason to include them, because the faunal composition of these regions is more likely to reflect the characteristics of the inflow than those of the lake.

Site locations should be plotted on a lake map. Each site should then be described in writing and photographed to provide a record for future comparison. thus, any change in the species assemblage at a location can be correlated with long term changes in habitat condition. This baseline record is also useful for monitoring any habitat destruction which may occur as a result of the sampling activities.

Local conditions of wind speed and direction, air and water temperature, water level, cloud cover, precipitation, etc. should also be noted at the time of sampling.

iii) Sampling Procedures

Sweep net samples are to be taken from the complete range of habitat type in the 0-1 m depth range. With care, the amount of extraneous substrate collected by this method can be minimized. This is desirable because it not only simplifies the task of sorting out the specimens, but also reduces damage to the habitat. During the collecting period the net should be emptied frequently to prevent clogging and loss of specimens. **Suggested sampling time: 10 minutes.**

As the final phase of the shoreline sampling, the field worker should spend time making hand collections of invertebrates by turning over rocks, inspecting debris and examining other hard to sample habitats. This is often the most effective way of sampling Trichoptera, Ephemeroptera, Mollusca and other sessile or burrowing animals. Specimens (other than leeches) should be preserved as they are collected. Note that leeches contract when preserved, thereby obscuring their taxonomically useful features. To prevent this problem it is usually easiest to identify the material live or to narcotize specimens with carbon dioxide (Alka Seltzer tablets, dilute soft drinks, soda water or beer) prior to preserving them. **Suggested sampling time: 15 minutes.**

iv) Secondary Sample Processing and Specimen Identification

Once the specimens have been brought back to the laboratory they are fixed with Kahle's fluid for two days. The preservative should then be changed to 70% Ethanol to prevent specimens from becoming bleached or embrittled.

To facilitate sorting, unprocessed, preserved samples may be stained with Rose Bengal solution (a vital stain that colours animal tissues pink) just prior to examining them in the laboratory.

Specimens should be identified to the species level (where possible) according to the taxonomic keys given in the references listed in Appendix 8, or with the aid of taxonomic experts. Type specimens of all taxa should be archived for future reference.

APPENDIX 2

LAKE INVENTORY DATA SUMMARIES WITH SAMPLING SITE DESCRIPTIONS

Substrate types:

LOS - highly organic flocculent
CSD - coarse sand
SLT - silt
COB - cobble
PEB - pebbles
BOU - boulders
BDR - bedrock

BLUE CHALK

Drainage System	Black River drainage watershed (2EC15). The outflow enters Red Chalk Lake which flows southward into the Pairo Lakes. The Pairo Lakes then flow to a creek enroute to the Black River which eventually reaches Lake Simcoe.
Geology	Minor till plain is the major surficial deposit (on average) at Blue Chalk, and the bedrock type is granitized biotite gneiss.
Crayfish Species	*Cambarus bartoni, Orconectes propinquus* and *Orconectes virilis* (Reid and David 1990).
Stresses	
Acidification:	The lake is rated as moderately sensitive to acid loading (Alkalinity = 84.2 $\mu eq \cdot L^{-1}$).
Eutrophication:	Secchi depth measurements (mean value = 6.0 m) and the chemical parameter total phosphorus (ice-free mean value = 5.65 $\mu eq \cdot L^{-1}$) indicate that Blue Chalk Lake is oligotrophic.
Site #1 CSD COB	shoreline - t-brush, logs, birch, white pine, cedar and spruce trees. substrate - sand (50% of the site), rocks (40%), macro Eriocaulon coverage (5%) and 5% sticks.
Site #2 LOS	shoreline - logs, t-brush, birch and white pine trees. substrate - detritus (70%) and 30% logs/sticks.
Site #3 LOS	shoreline - t-brush, cedar, birch, white pine and balsam fir trees. substrate - detritus (65% of the site) and 35% stick/logs.
Site #4 CSD PEB LOS	shoreline - t-brush, logs, cedar, birch, white pine, maple and balsam fir trees substrate - sand/PEB (45% of the site), detritus (40%), sticks/logs 10%) and 5% macros.
Site #5 CSD	shoreline - t-brush, logs, birch, cedar, white pine and maple trees. substrate - sand (75% of the site), macros (20%) and 5% logs/sticks.

CLEAR LAKE

Drainage System	Cameron Lake drainage watershed (2HF08). The outflow enters Big Hawk Lake which flows southward to Halls Lake. Halls Lake flows through Boshkung, Mountain and Horseshoe Lakes enroute to the Gull River which eventually reaches Lake Simcoe and then Georgian Bay in Lake Huron (Reid and Snyder 1986).
Geology	The surficial cover is dominated by thin till and rock ridges. The biotite gneiss is composed of metamorphosed beds of greywacke, arkose and sandstone (Reid and Snyder 1986). The bedrock type is biotite gneiss with traces of small marble interbeds.
Crayfish Species	*Cambarus bartoni* and *Orconectes propinquus*.
Stresses Acidification:	The lake is rated as extremely sensitive to acid loading (Alkalinity = 7.8 $\mu eq \cdot L^{-1}$).
Eutrophication:	Cultural eutrophication is not a stress in Clear Lake. Secchi depth measurements (mean value = 7.8 m) and the chemical parameter total phosphorus (ice-free mean value = 3.8 $\mu eq \cdot L^{-1}$) indicate that Clear Lake is oligotrophic.
Site #1 CSD COB	shoreline - lab. tea, white pine and hemlock trees. substrate - sand (70% of the site) and 30% cobble.
Site #2 CSD COB	shoreline - bedrock, boulders, white pine and cedar trees. substrate - sand (70% of the site) and 30% rocks/cobble.
Site #3 CSD LOS	shoreline - lab. tea, white pine and cedar trees. substrate - sand (50% of the site), detritus (30%) and 20% macros.
Site #4 CSD COB	shoreline - lab. tea and cedar trees. substrate - sand (60% of the site), macros (30%) and 10% rock.
Site #5 LOS	shoreline - bedrock, lab. tea, white pine and hemlock trees. substrate - detritus (70% of the site), Eriocaulon (20%) and 10% logs.

CRADLE LAKE

Drainage System	Upper Madawaska River watershed (2KD18). The outflow is south into Bonnechere Lake which flows into Phipps Lake and then on through a series of lakes which eventually lead to the Upper Madawaska River and on to the Ottawa River.
Geology	The surficial cover of the watershed consist of (22.7% of the area) by sand and gravel, underlined with 44.6% of unsubdivided veneer. Bedrock knobs account for 0.4% of the watershed. The bedrock in this watershed consists of granite, gneiss, quartzose sandstone, syenitic and associated alkalic rocks (100% of the land area).
Crayfish Species	*Cambarus bartoni.*
Stresses	
Acidification:	The lake is rated as extremely sensitive to acid loading (Alkalinity = 9.4 μeq·L^{-1}).
Eutrophication:	Secchi depth measurements (mean value = 7.7 m) and the chemical parameter total phosphorus (ice-free mean value = 6.2 μeq·L^{-1}) indicate that Cradle Lake is oligotrophic.
Site #1 LOS CSD COB	shoreline - leather leaf, black spruce and tamarack trees. substrate - detritus (40% of the site), sand (35%), sticks & logs (20%) and 5% rocks.
Site #2 LOS	shoreline - leather leaf and tamarack trees. substrate - detritus (80% of the site) and 20% logs/sticks.
Site #3 COB PEB CSD LOS	shoreline - leather leaf. substrate - rock/stones (40% of the site), sand (30%), logs/sticks (25%) and 5% detritus.
Site #4 LOS	shoreline - black spruce, white pine, cedar and hemlock trees. substrate - detritus (80% of the site), and 20% logs/sticks.
Site #5 LOS	shoreline - "dead heads", cedar and hemlock trees. substrate - LOS (100% of the site).

CROSSON LAKE

Drainage System	Black River drainage watershed (2EC15). The outflow joins Clear Creek which flows southward into the Black River. The Black River then eventually reaches Lake Simcoe.
Geology	The surficial geology of Crosson Lake is composed of peat and ponded areas surrounded by expanses of thin till and rock ridges. The bedrock type in this basin is migmitite (0-30% mafic).
Crayfish Species	*Cambarus bartoni* and *Orconectes virilis.*
Stresses	
Acidification:	The lake is rated as extremely sensitive to acid loading (Alkalinity = 9.0 μeq$\cdot$L^{-1}).
Eutrophication:	Secchi depth measurements (mean value = 3.5 m) and the chemical parameter total phosphorus (ice-free mean value = 10.2 μeq$\cdot$L^{-1}) indicate that Crosson Lake is mesotrophic.
Site #1 COB PEB CSD LOS	shoreline - mostly boulders & bedrock, T-brush, hemlocks, large pines, balsam firs, oaks and ferns. substrate - rocks & PEB (45% of the site), sand (45%), macros (5%) and 5% detritus.
Site #2 COB CSD	shoreline - large rocks, T-brush, hemlocks, birches, oaks and floating LOS logs. substrate - logs/sticks (60% of the site), detritus (20%), rock (10%), sand (5%) and 5% macros.
Site #3 CSD LOS	shoreline - T-brush, floating logs, birch, balsam fir and large pine trees. substrate - sand (60% of the site), detritus (20%), sticks (10%) and 10% macros (lily pads).
Site #4 CSD LOS	shoreline - marsh like area (T-brush back about 40'), cedar, tall pines hemlock, birch and floating logs. substrate - sand (30% of the site), sticks (30%), detritus (30%) and 10% macros (arrowheads & lily pads).
Site #5 LOS COB CSD	shoreline - mostly hemlock, two yellow birches, ferns, and fallen trees. substrate - detritus (50% of the site), macros (20%), rocks (10%), sand (10%) and 10% sticks.

DELANO LAKE

Drainage System	Upper Madawaska River drainage watershed (2KD1). The lake flows through Cache Lake and into the Upper Madawaska River. The Madawaska River flows east through a series of lakes to enter the Ottawa River at Arnprior.
Geology	The surficial cover consist of bedrock knobs and ridges with very thin, discontinuous drift cover (56.4%). Adjacent areas of thin drift with numerous outcrops (12.0% of the area) are accompanied by glaciofluvial outwash (12.7%). Organic depositions (8.8%) follow Delano Creek from the one pond (0.4% of the area) to Delano Lake. The bedrock geology consists of granite, gneiss, quartzose sandstone, syenitic and associated alkalic rocks (76.1% of the land area).
Crayfish Species	*Cambarus bartoni, Orconectes propinquus* and *Orconectes virilis.*
Stresses	
Acidification:	The lake is rated as moderately sensitive to acid loading (Alkalinity = 46 μeq·L^{-1}).
Eutrophication:	Secchi depth measurements (mean value = 3.8 m) and the chemical parameter total phosphorus (ice-free mean value = 7.1 μeq·L^{-1}) indicate that Delano Lake is oligotrophic.
Site #1 LOS	shoreline - floating logs with sphagnum, leather leaf, black spruce and cedar trees. substrate - macrophytes (50% of the site), and 50% detritus.
Site #2 LOS COB	shoreline - leather leaf, cedar and hemlock trees. substrate - detritus (60% of the site), sticks (30%) and 10% rocks.
Site #3 LOS	shoreline - leather leaf, cedar and hemlock trees. substrate - detritus (70% of the site) and 30% sticks.
Site #4 LOS	shoreline - leather leaf, balsam fir and hemlock trees. substrate - detritus (90% of the site) and 10% sticks.
Site #5 BOU LOS	shoreline - leather leaf along shore, accompanied by hemlock trees. substrate - BOU (80% of the site) and 20% detritus.

HAMER LAKE

Drainage System	Lake Rosseau drainage watershed (2EB5). The outflow enters Silver Lake which flows south-east into Gordon Bay on Lake Joseph.
Geology	The bedrock geology of this watershed consists of granite, gneiss, quartzose sandstone, syenitic and associated alkalic rocks.
Crayfish Species	*Orconectes virilis.*
Stresses	
Acidification:	The lake is rated as extremely sensitive to acid loading (Alkalinity = 7.2 μeq·L^{-1}).
Eutrophication:	Secchi depth measurements (mean value = 1.8 m) and the chemical parameter total phosphorus (ice-free mean value = 11.3 μeq·L^{-1}) indicate that Hamer Lake is mesotrophic.
Site #1 LOS	shoreline - grasses, labrador tea, several dead trees, pine and birch trees. substrate - detritus (60%), Eriocaulon and arrow heads (35%) and 5% logs.
Site #2 LOS CSD	shoreline - submerged ferns, labrador tea, floating grasses, logs, dead fallen trees, pine and hemlock trees. substrate - macros: lilypads and Eriocaulon (40%), detritus (25%), sand (20%) and 15% logs.
Site #3 BDR	shoreline - labrador tea, grasses, floating logs, large rocks, hemlock and white pine trees. substrate - macros: arrow-head and Eriocaulon (40%), rock shelf (30%), BDR (20%) and 10% logs.
Site #4 SLT LOS COB	shoreline - few rocks along shoreline, labrador tea, grasses, white pines, oaks and maple. substrate - SLT/detritus (40%), macrophytes Ericocaulon (40%), rocks (10%) and 10% sticks.
Site #5 LOS	shoreline - tall pines, hemlock trees, labrador tea, grasses, ferns, birch trees, floating logs and several dead trees. substrate - detritus (50%), sticks/logs (25%) and macros: lilypads (25%).

HARP LAKE

Drainage System	Upper North Branch Muskoka River drainage watershed (2EB13). The outflow enters Peninsula Lake which flows south-west to Fairy Lake. Fairy Lake then flows into the North Branch Muskoka River. The Muskoka and Moon River system finally enters into Georgian Bay on Lake Huron.
Geology	Minor till plain is the major surficial deposit at Harp Lake. The bedrock geology in this basin consist of granitized biotite and hornblende gneiss, diorite and amphibolite and schist.
Crayfish Species	*Cambarus bartoni* and *Orconectes propinquus.*
Stresses	
Acidification:	The lake is rated as moderately sensitive to acid loading (Alkalinity = 68 $\mu eq \cdot L^{-1}$).
Eutrophication:	Secchi depth measurements (mean value = 3.8 m) and the chemical parameter total phosphorus (ice-free mean value = 7.1 $\mu eq \cdot L^{-1}$) indicate that Harp Lake is oligotrophic.
Site #1 LOS CSD	shoreline - t-brush, birch and balsam fir trees. substrate - detritus (35% of the site), macros (Eriocaulon, Lobelia and arrow heads, 25% coverage) and 20% sand.
Site #2 COB CSD	shoreline - rock face (15' high), hemlock, birch and pine trees. substrate - rocks and COB (65% of the site), sand (30%) and 5% macros (Eriocaulon).
Site #3 CSD COB	shoreline - brush, old stumps, cedar, pine, hemlock and birch trees. substrate - sand (70% of the site), rocks (20%), sticks (5%) and 5% macros (Eriocaulon).
Site #4 CSD COB	shoreline - t-brush, floating logs, yellow birch, cedar and balsam firs. substrate - sand (40% of the site), macros (Eriocaulon coverage 40%), rocks (10%) and 10% sticks.
Site #5 LOS COB PEB CSD	shoreline - hemlock, yellow birch, white birch and cedar trees. substrate - sticks & logs (40% of the site), detritus (25%), rocks/PEB (20%), macros (10%) and 5% sand.

HENEY LAKE

Drainage System	South Branch Muskoka River drainage watershed (2EB09). Heney Lake is a headwater lake with no open water found within the watershed. The easterly outflow combines with the Dickie Lake outflow and joins the South Muskoka River to the southeast. The South Muskoka River then empties into Lake Muskoka and eventually into Lake Huron/Georgian Bay.
Geology	The surficial cover is dominated by a thin veneer of sandy till. Silt and fine sand underlay the peat bogs found adjacent to the lake. The bedrock type is undifferentiated migmatites. Zones of mafic enrichment are common.
Crayfish Species	*Orconectes virilis*
Stresses	
Acidification:	Heney Lake is rated as **extremely sensistive** to heavy acid loadings as a result of the low buffering capacity (TIA Alkalinity = 6 μeq·L^{-1}).
Eutrophication:	Analysis of Secchi depth measurements (mean value = 3.8 m) and chemical parameters such as total phosphorus (ice-free mean value = 6.0 μeq·L^{-1}) indicate that Heney Lake is oligotrophic.
Site # 1 COB LOS	shoreline - small shrubs (T-brush and larch), large pines, birches. substrate - scattered rocks/BOU (45% of the site), detritus (35%) and 20% Eriocaulon and lily pads.
Site # 2 LOS COB	shoreline - T-brush, rocky, large pines and hemlocks substrate - detritus (50% of the site), rock (45%) and 5% lily pads.
Site # 3 SLT COB	shoreline - numerous T-brush, large pines and birches. substrate - SLT (70% of the site), logs (15%), rock (10%) and 5% lily pads.
Site # 4 SLT LOS	shoreline - T-brush, mostly coniferous forest (spruce dominated). substrate - Eriocaulon mats (60% of the site), SLT (20%), detritus (15%) and 5% lily pads.
Site # 5 COB CSD LOS	shoreline - T-brush, mostly deciduous forest, white pines. substrate - Eriocaulon mats (50% coverage of the site), COB imbedded in CSD (40%) and 10% detritus.

PEARCELEY LAKE

Drainage System	Nineteen Georgian Bay tributaries watershed (2EA20). The outflow runs west through Boyce Creek and eventually drains into Lake Huron via the Magnetawan River and Georgian Bay.
Geology	The surficial cover of the watershed is dominated by till (64.7%), accompanied with unsubdivided glaciofluvial outwash (7.5%). The bedrock in this watershed consists of granite, gneiss, quartzose sandstone, syenitic and associated alkalic rocks (86.9% of the land area).
Crayfish Species	*Cambarus bartoni.*
Stresses	
Acidification:	Pearceley Lake is rated as acidified as a result of the low buffering capacity (TIA Alkalinity = μ eq·L^{-1}).
Eutrophication:	Cultural eutrophication is not a stress in Pearceley Lake. Secchi depth measurements (mean value = 5.5 m) and the chemical parameter total phosphorus (ice-free mean value = 4.5 μeq·L^{-1}) indicate that Pearceley Lake is oligotrophic.
Site #1 COB CSD LOS	shoreline - large rocks, oaks, ferns, birch, spruce, balsam firs, labrador tea and grasses. substrate - rocks (40%), sand (30%), detritus (15%) and 15% sticks.
Site #2 COB CSD LOS	shoreline - large rocks, stumps, floating logs, spruce, birch and labrador tea. substrate - rocks (40%), sand (20%), detritus (20%) and 20% sticks.
Site #3 LOS/SLT CSD	shoreline - rocky shore, large logs, spruce, birch and pine trees. substrate - detritus/SLT (40%), rocks (30%) and 10 % macrophytes.
Site #4 PEB/CSD	shoreline - balsam firs, yellow birch and labrador tea. substrate - stones/rocks (50%), SLT/detritus (30%) and 20% logs.
Site #5 SLT/LOS COB	shoreline - birch, spruce, grasses, labrador tea, floating logs, bullrushes. substrate - logs (30%), SLT/detritus (30%) and rock (20%).

PINCHER LAKE

Drainage System	Moon River and Go Home River watershed (2EB13). The outflow runs southwest to Clara Lake which flows through a series of lakes which eventually leads to Lake Huron.
Geology	The surficial cover is dominated (61.8% of the area) by bedrock knobs and ridges, with very thin discontinuous drift cover. Sections of till account for 19.1% of the watershed. Pond areas cover 2.4%, and swamp and organic deposits cover 2.7% of the watershed. The bedrock geology consists of granite, gneiss, quartzose sandstone, syenitic and associated alkalic rocks (96.7% of the land area).
Crayfish Species	*Cambarus bartoni.*
Stresses Acidification:	The lake is rated as extremely sensitive to acid loading (Alkalinity = -1 μeq·L^{-1}).
Eutrophication:	Secchi depth measurements (mean value = 5.3 m) and the chemical parameter total phosphorus (ice-free mean value = 7.5 μeq·L^{-1}) indicate that Pincher Lake is oligotrophic.
Site #1 COB LOS	shoreline - leather leaf, cedar, black spruce and tamarack trees. substrate - rocks (40% of the site), detritus (30%) and 30% sticks.
Site #2 LOS	shoreline - leather leaf. substrate - detritus (80% of the site), and 20% sticks.
Site #3 LOS CSD COB	shoreline - leather leaf, hemlock, cedar and black spruce. substrate - detritus (50% of the site), sand (20%), rocks (10%), sticks (10%) and 10% macrophytes.
Site #4 LOS COB	shoreline - leather leaf, hemlock, cedar and black spruce. substrate - detritus (55% of the site), sticks (40%) and 5% rocks.
Site #5 LOS	shoreline - leather leaf and cedar trees. substrate - logs/sticks (60% of the site), and 40% detritus.

PLASTIC LAKE

Drainage System	Cameron Lake drainage watershed (2HF10). The outflow runs south to St. Nora Lake. St. Nora Lake eventually flows through Boshkung, Mountain and Horseshoe Lakes en route to the Gull River which eventually reaches Lake Simcoe and then Georgian Bay in Lake Huron (Girard et al. 1985).
Geology	The surficial cover of the watershed is dominated by a shallow, discontinuous, sand basal till containing angular to sub-angular boulders (Girard et al. 1985). The bedrock is an erosion and weather resistant gneiss, with a substantial igneous component. A small meta-gabbro plug appears on the east shoreline of the lake.
Crayfish Species	No crayfish were caught in the 1988 study .
Stresses Acidification:	The lake is rated as extremely sensitive to acid loading (Alkalinity = 12 $\mu eq \cdot L^{-1}$).
Eutrophication:	Cultural eutrophication is not a stress. Secchi depth measurements (mean value = 6.1 m) and the chemical parameter total phosphorus (ice-free mean value = 5.1 $\mu eq \cdot L^{-1}$) indicate that Plastic Lake is oligotrophic.
Site #1 LOS CSD	shoreline - medium size rocks, "dead heads", white pine, cedars and white birch. substrate - rocks/sticks (50%), detritus (20%), sand (10%) and 10% macrophytes Eriocaulon.
Site #2 LOS	shoreline - labrador tea, flat rock, large dead trees and saplings of white pine. substrate - mixture of LOS and detritus, accompanied with 60% macrophytes.
Site #3 LOS	shoreline - located near the mouth of the stream (pc1). The shoreline LOS consists of large flat rocks with lots of vegetation (several species of grasses). substrate - logs (40% of the site) and 30% macrophyte Eriocaulon.
Site #4 COB CSD SLT	shoreline - rocky bottom accompanied by "dead heads"; hemlock, white pine, cedar and labrador tea (type of shrub). substrate - rocks (50%), sand/SLT (20%), macrophytes (20%) and 10% logs/boulders.
Site #5 LOS COB BOU	shoreline - The shoreline contains bedrock up to the waterline; hemlock and large white pines. substrate - logs/sticks (50%), rocks/BOU (30%) and 20% macrophytes.

SKIDWAY LAKE

Drainage System	Moon River and Go Home River watershed (2EB2). The outflow runs south to Code Lake and eventually drains into Lake Huron via a variety of small lakes.
Geology	The surficial cover is dominated by thin drift (83.3%), while the remaining 16.7% is lake surface area. The bedrock geology in this watershed consists of granite, gneiss, quartzose sandstone, syenitic and associated alkalic rocks (100% of the land area).
Crayfish Species	*Orconectes virilis.*
Stresses	
Acidification:	The lake is rated as extremely sensitive to acid loading (Alkalinity = -4.8 $\mu eq \cdot L^{-1}$).
Eutrophication:	Cultural eutrophication is not a stress. Secchi depth measurements (mean value = 4.4 m) and the chemical parameter total phosphorus (ice-free mean value = 6.7 $\mu eq \cdot L^{-1}$) indicate that Skidway Lake is oligotrophic.
Site #1 LOS	shoreline - leather leaf, hemlock and red oak trees. substrate - detritus (90% of the site), and 10% sticks/logs.
Site #2 LOS	shoreline - stumps, sticks, hard stem bulrush and hemlock trees. substrate - hard stem bulrush (50% of the site).
Site #3 LOS	shoreline - leather leaf, hemlock and red oak trees. substrate - detritus (65% of the site), and 35% sticks.
Site #4 LOS	shoreline - water lily, arrow heads, leather leaf, white pine and hemlock trees. substrate - detritus (70% of the site), sticks (20%) and 10% macrophytes.
Site #5 LOS CSD	shoreline - leather leaf flood plain with sticks and logs. substrate - detritus and sand.

WESTWARD LAKE

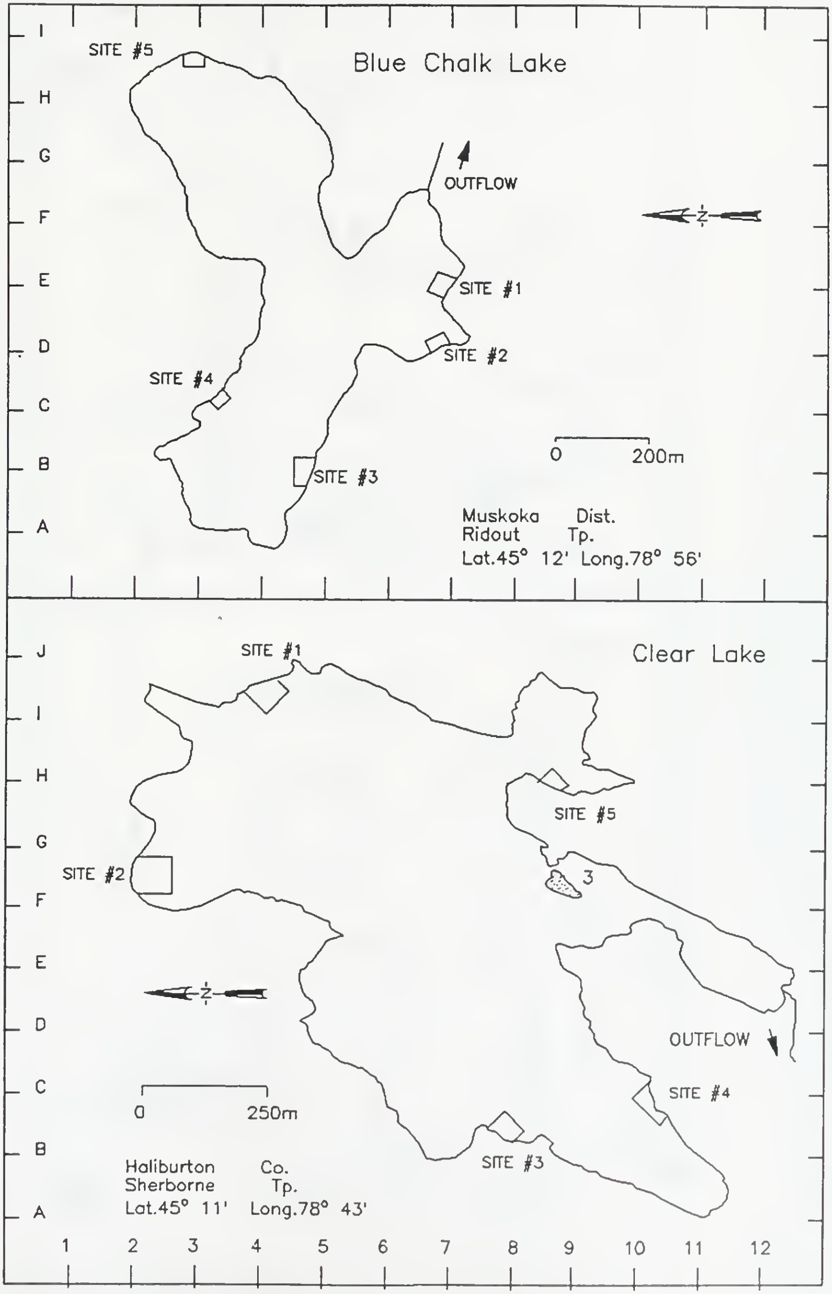
Drainage System	Oxtongue River drainage watershed (2EB11). Westward flows through a pond and enters the Oxtongue River. The flow then continues through to Lake of Bays and into the South Muskoka River. The Muskoka and Moon River system finally enters into Georgian Bay on Lake Huron.
Geology	The surficial cover is dominated by bedrock knobs and ridges with very thin, discontinuous drift (49.4%). Adjacent areas of thin drift with numerous outcrops (17.6% of the area) are accompanied by glaciofluvial outwash (4.9%). The only pond which is located at the north end of Westward Lake accounts for 0.5% of the watershed. The bedrock geology consists of granite, gneiss, quartzose sandstone, syenitic and associated alkalic rocks (93.1% of the land area).
Crayfish Species	*Cambarus bartoni* and *Orconectes propinquus.*
Stresses	
Acidification:	The lake is rated as moderately sensitive to acid loading (Alkalinity = 42.1 $\mu eq \cdot L^{-1}$).
Eutrophication:	Secchi depth measurements (mean value = 6.4 m) and the chemical parameter total phosphorus (ice-free mean value = 4.4 $\mu eq \cdot L^{-1}$) indicate that Westward Lake is oligotrophic.
Site #1 LOS CSD	shoreline - cedar and black spruce trees. substrate - thin veneer detritus (50% of the site), sticks/logs (30%) and 20% exposed sand.
Site #2 LOS	shoreline - cedar and black spruce trees. substrate - sticks/logs (100% of the site detritus).
Site #3 CSD LOS COB	shoreline - cedar trees. substrate - sand (40% of the site), detritus (40%), rocks (10%) and 10% sticks/logs.
Site #4 COB CSD	shoreline - leather leaf and black spruce trees. substrate - rocks (80% of the site), sand (10%) and 10% sphagnum moss.
Site #5 LOS COB	shoreline - leather leaf, cedar, white pine and black spruce trees. substrate - detritus, logs/sticks and rocks (percentages unknown).

YOUNG LAKE

Drainage System	Skeleton River drainage watershed (2EB7). The outflow joins Skeleton River which flows into Skeleton Bay on Lake Rosseau.
Geology	The bedrock geology in this watershed consists of granite, gneiss, quartzose sandstone, syenitic and associated alkalic rocks.
Crayfish Species	*Cambarus bartoni* and *Orconectes propinquus.*
Stresses Acidification:	The lake is rated as moderately sensitive to acid loading (Alkalinity = 90.2 $\mu eq \cdot L^{-1}$).
Eutrophication:	Secchi depth measurements (mean value = 5.7 m) and the chemical parameter total phosphorus (ice-free mean value = 7.5 $\mu eq \cdot L^{-1}$) indicate that Young Lake is oligotrophic.
Site #1 CSD PEB LOS SLT	shoreline - grasses, white pine, birch, cedar, balsam fir and maple trees. substrate - macros (Eriocaulon mats, coverage 40%), sand/PEB (30%), SLT /detritus (25%) and 5% sticks.
Site #2 CSD LOS	shoreline - t-brush, floating logs, white pine, oak, birch and balsam fir trees. substrate - sand (85% of the site), detritus (10%) and 5% sticks.
Site #3 CSD LOS	shoreline - floating logs, cedar, birch, white pine and hemlock trees. substrate - sand (80% of the site), detritus (10%), sticks/logs (5%) and 5% macrophytes (Eriocaulon).
Site #4 LOS	shoreline - t-brush, grasses, floating logs, cedar, birch and hemlock SLT trees. substrate - SLT/detritus (45% of the site), macros (reeds and Eriocaulon mats, coverage 45%) and 10% logs.
Site #5 CSD LOS	shoreline - t-brush, white pine, cedar, birch and hemlock trees. substrate - sand (50% of the site), detritus (40%) and 10% logs/sticks.

APPENDIX 3

MAPS OFTHE STUDY LAKES


Blue Chalk Lake
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OUTFLOW
SITE #1
SITE #2
SITE #4
SITE #3
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Muskoka Dist.
Ridout Tp.
Lat.45° 12' Long.78° 56'
I
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Clear Lake
SITE #1
SITE #5
SITE #2
3
OUTFLOW
SITE #4
SITE #3
N
0 250m
Haliburton Co.
Sherborne Tp.
Lat.45° 11' Long.78° 43'
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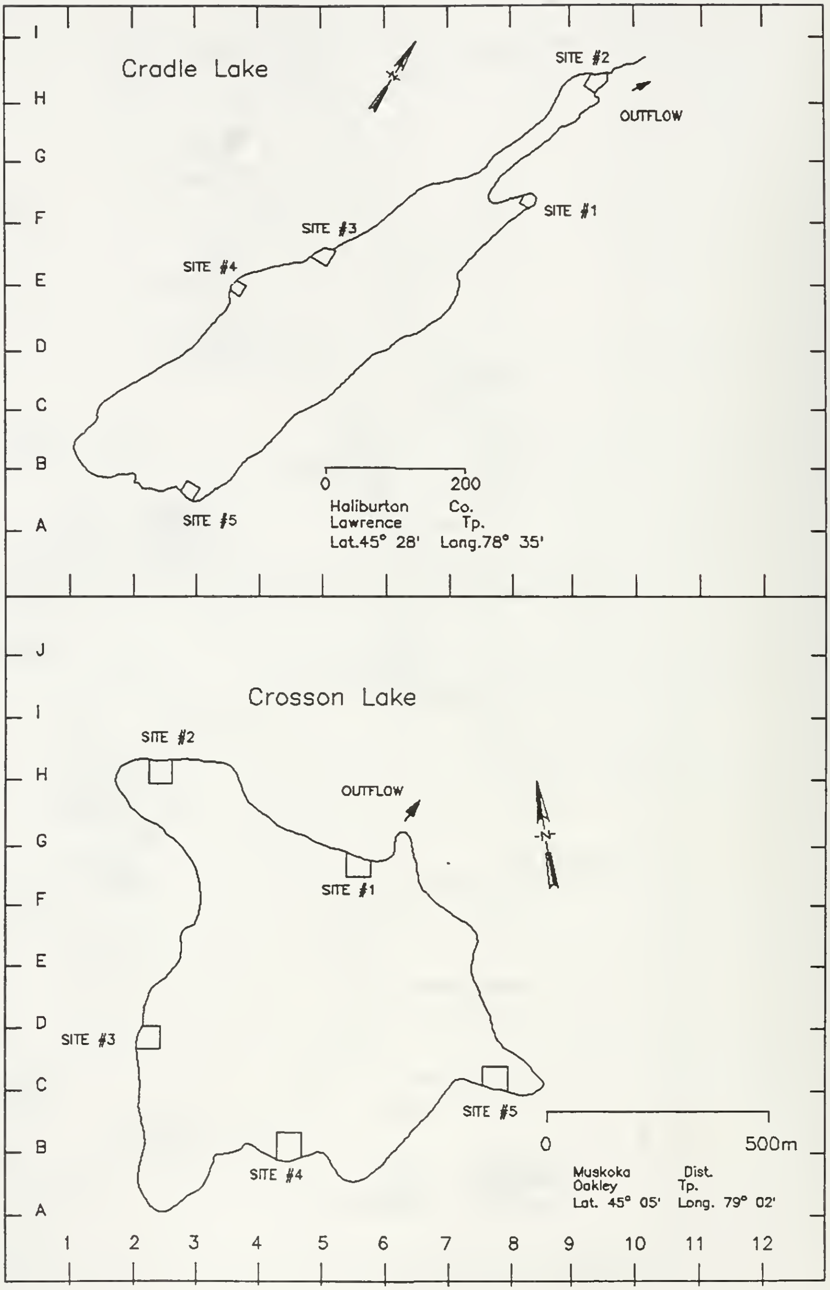
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SITE #2
SITE #3
SITE #4
SITE #5
OUTFLOW
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Haliburton Co.
Lawrence Tp.
Lat.45° 28' Long.78° 35'
Crosson Lake
SITE #1
SITE #2
SITE #3
SITE #4
SITE #5
OUTFLOW
N
0
500m
Muskoka Dist.
Oakley Tp.
Lat. 45° 05' Long. 79° 02'
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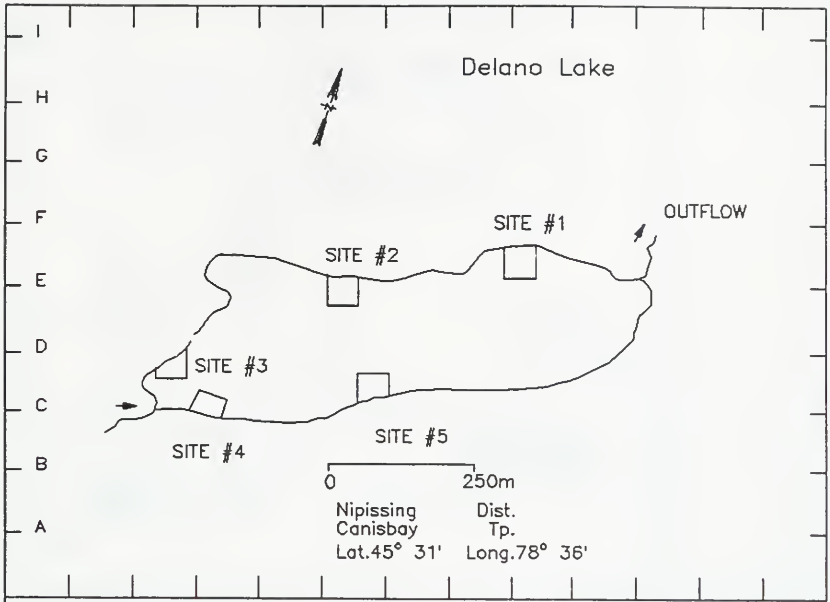
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SITE #2
SITE #3
SITE #4
SITE #5
OUTFLOW
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Nipissing Dist.
Canisbay Tp.
Lat.45° 31' Long.78° 36'
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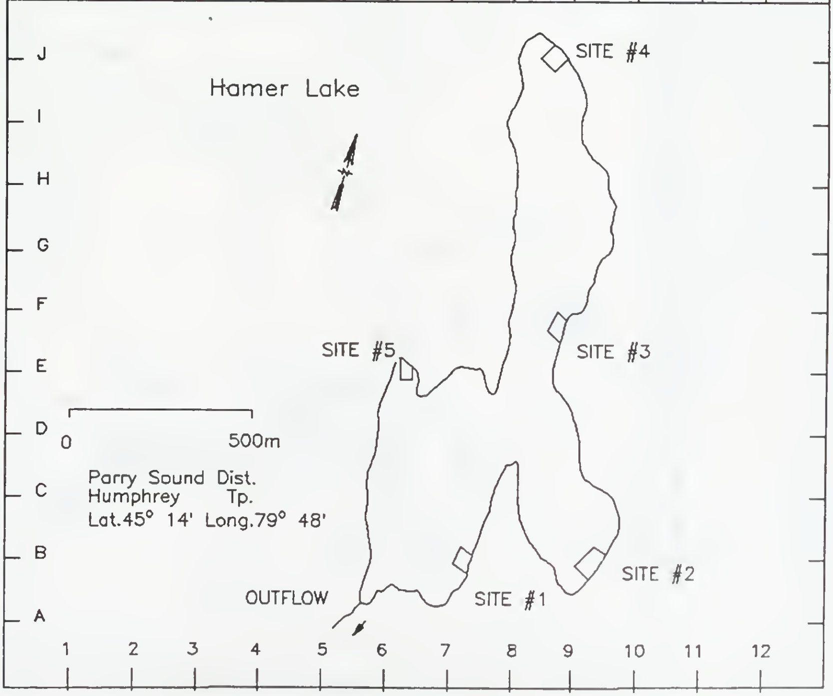
Hamer Lake
SITE #1
SITE #2
SITE #3
SITE #4
SITE #5
OUTFLOW
0
500m
Parry Sound Dist.
Humphrey Tp.
Lat.45° 14' Long.79° 48'
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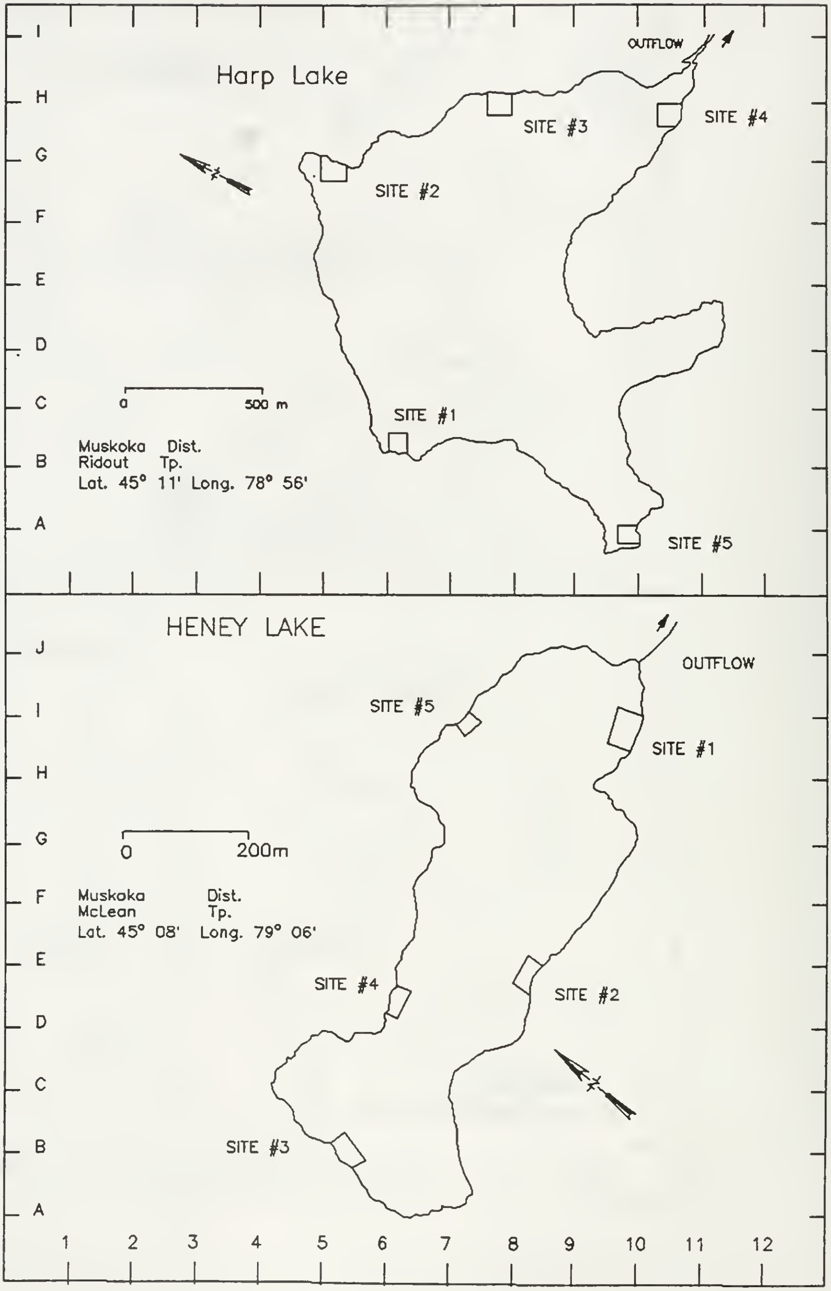
Harp Lake
OUTFLOW
SITE #1
SITE #2
SITE #3
SITE #4
SITE #5
0
500 m
Muskoka Dist.
Ridout Tp.
Lat. 45° 11' Long. 78° 56'
I
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HENEY LAKE
OUTFLOW
SITE #5
SITE #1
SITE #4
SITE #2
SITE #3
0
200m
Muskoka Dist.
McLean Tp.
Lat. 45° 08' Long. 79° 06'
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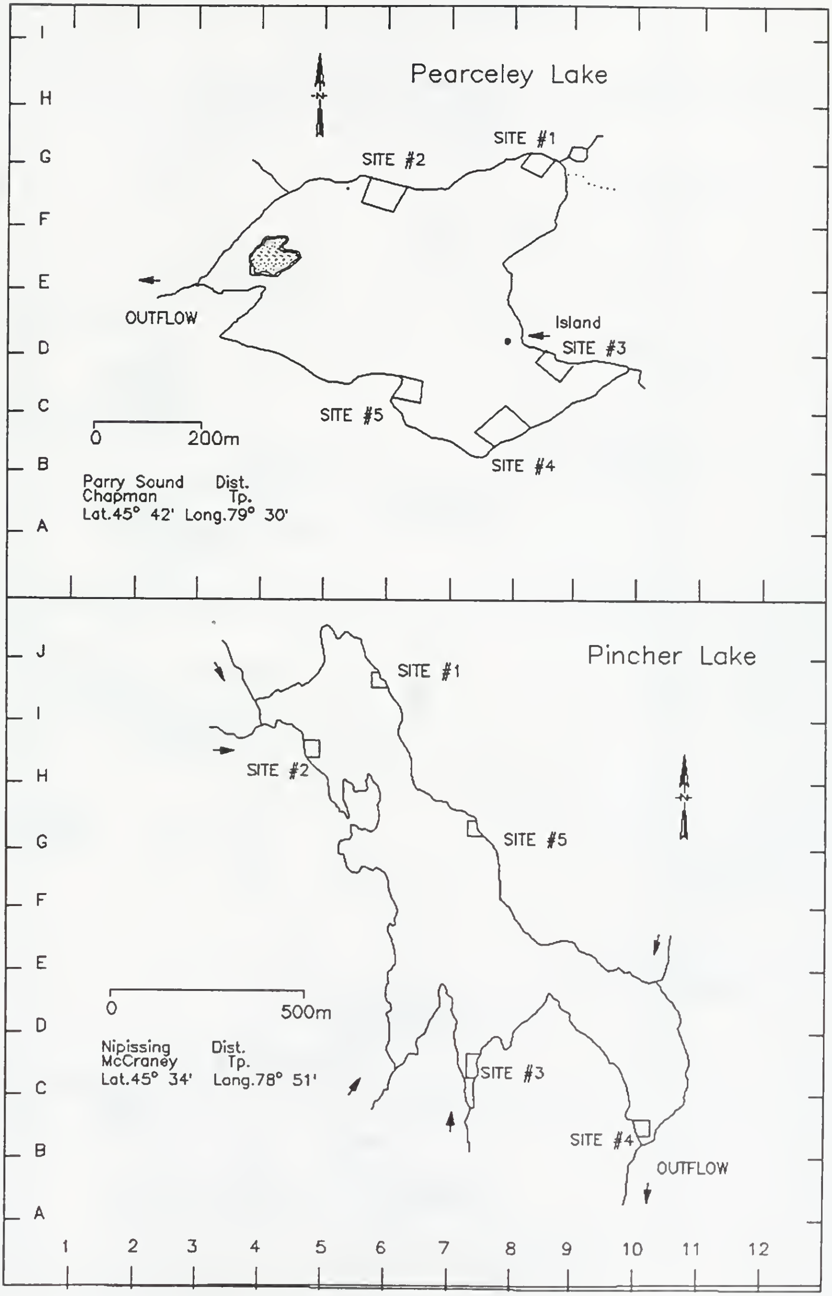
Pearceley Lake
SITE #1
SITE #2
SITE #3
SITE #4
SITE #5
Island
OUTFLOW
0 200m
Parry Sound Dist.
Chapman Tp.
Lat.45° 42' Long.79° 30'
Pincher Lake
SITE #1
SITE #2
SITE #3
SITE #4
SITE #5
OUTFLOW
0 500m
Nipissing Dist.
McCraney Tp.
Lat.45° 34' Long.78° 51'
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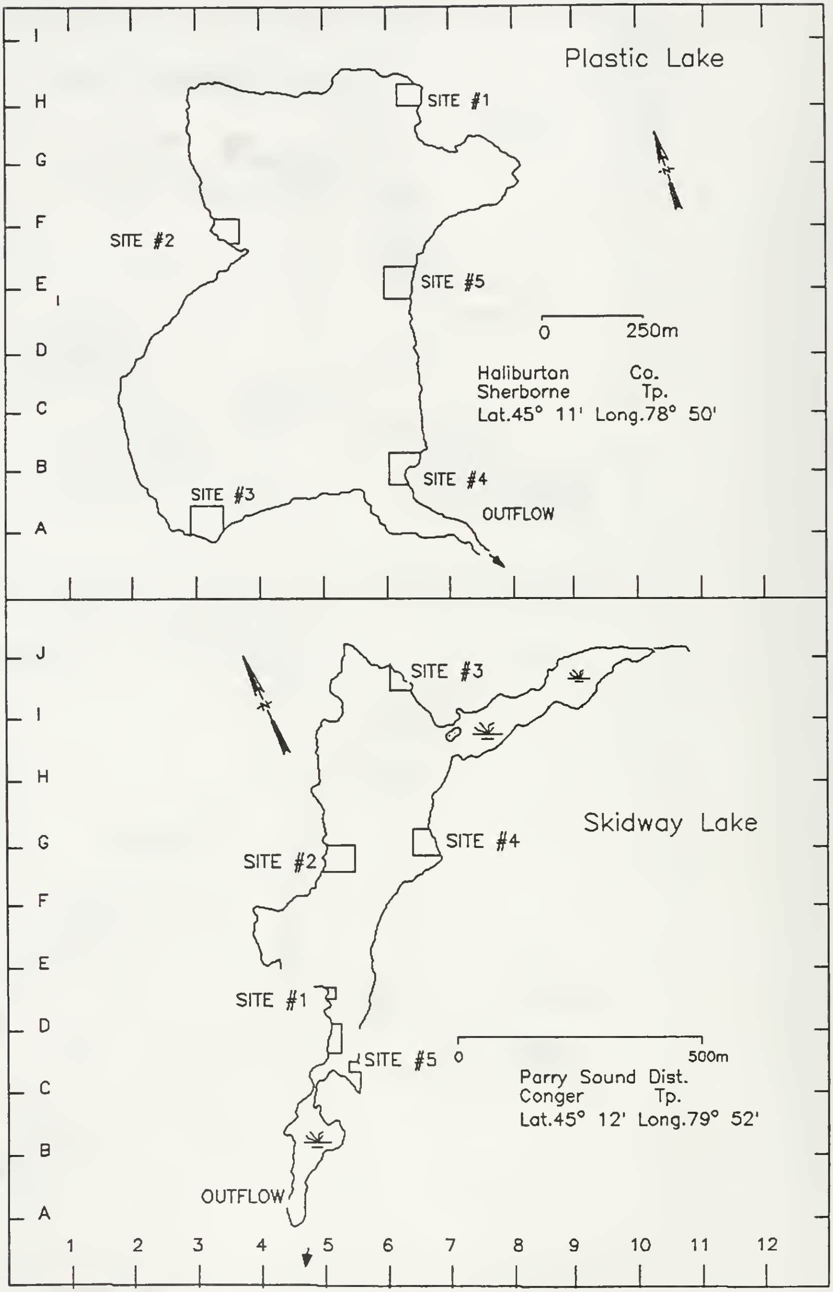
Plastic Lake
SITE #1
SITE #2
SITE #5
SITE #3
SITE #4
OUTFLOW
0 250m
Haliburton Co.
Sherborne Tp.
Lat.45° 11' Long.78° 50'
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Skidway Lake
SITE #3
SITE #4
SITE #2
SITE #1
SITE #5
OUTFLOW
0 500m
Parry Sound Dist.
Conger Tp.
Lat.45° 12' Long.79° 52'
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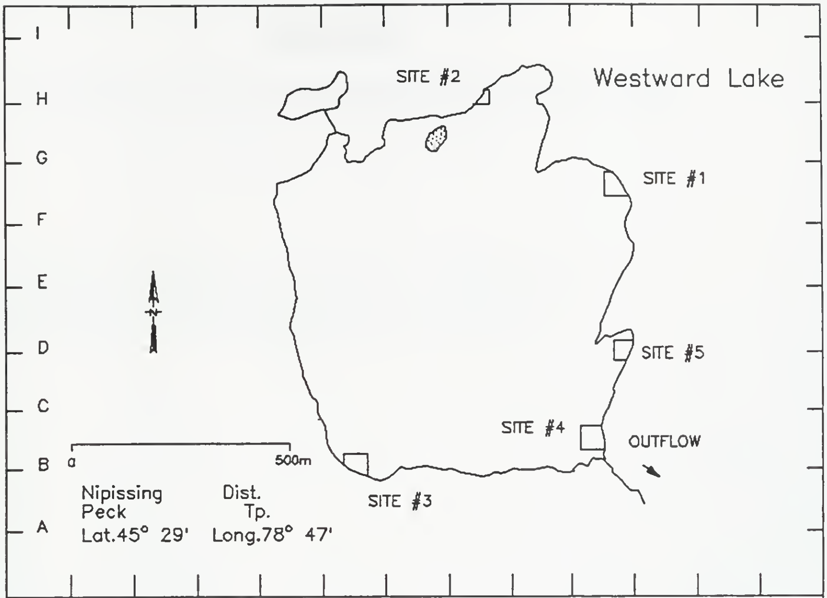
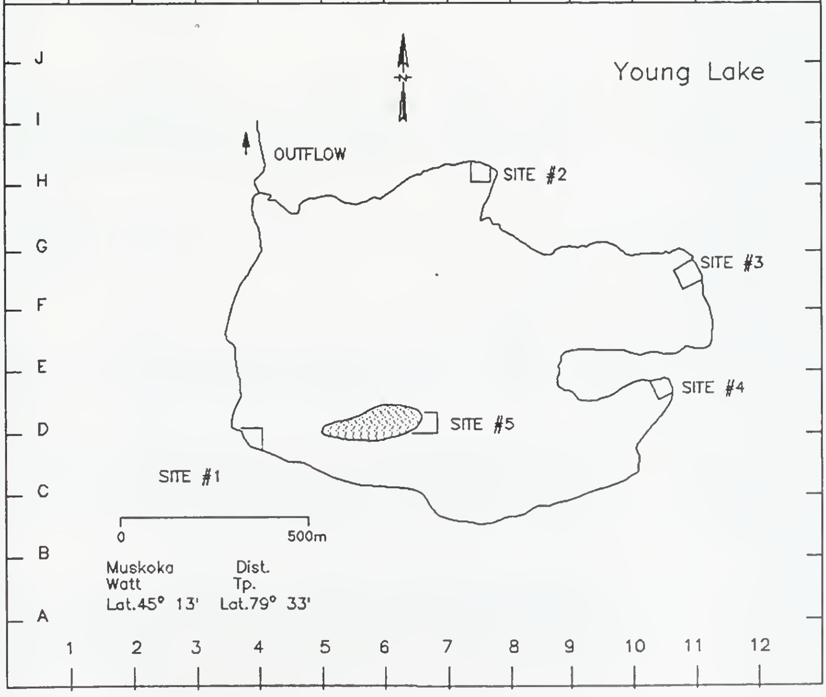
11
12


Westward Lake
SITE #1
SITE #2
SITE #3
SITE #4
SITE #5
OUTFLOW
N
0
500m
Nipissing Dist.
Peck Tp.
Lat.45° 29' Long.78° 47'
I
H
G
F
E
D
C
B
A


Young Lake
SITE #1
SITE #2
SITE #3
SITE #4
SITE #5
OUTFLOW
N
0
500m
Muskoka Dist.
Watt Tp.
Lat.45° 13' Lat.79° 33'
J
I
H
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APPENDIX 4

TAXONOMIC LIST AND ASSOCIATED DATABASE CODES

Appendix 4: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
1	2026	COELENTERATA	HYDROZOA	HYDROIDA		HYDRIDAE			HYDRA		
100	2119	PLATYHELMINTHES	TURBELLARIA								
102	2123	PLATYHELMINTHES	TURBELLARIA	TRICLADIDA		PLANARIIDAE			DUGESIA		TIGRINA
200	2103	NEMATODA									
202	2106	NEMATODA		MONONCHIDA		MONONCHIDAE			ANATONCHUS		
203	2109	NEMATODA	ADENOPHOREA	DORYLAIMIDA	DORYLAIMINA	DORYLAIMIDAE			DORYLAIMUS		
204	2136	NEMATODA	ADENOPHOREA	ENOPLIDA	MERMITHOIDEA	MERMITHIDAE			DIVISPICULIMERIS		
206	2111	NEMATODA	ADENOPHOREA	ENOPLIDA	MERMITHOIDEA	MERMITHIDAE			HYDROMERMIS		
208	2112	NEMATODA	ADENOPHOREA	ENOPLIDA	MERMITHOIDEA	MERMITHIDAE			LIMNOMERMIS		
210	2108	NEMATODA	ADENOPHOREA	ENOPLIDA	MERMITHOIDEA	MERMITHIDAE			MERMITHIDAE		
212		NEMATODA	ADENOPHOREA	DORYLAIMIDA	DORYLAIMINA	DORYLAIMIDAE			PARACTINOLAIMUS		
300	263	ANNELIDA	OLIGOCHAETA								
302	237	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			ARCTEONAIS		LOMONDI
303	278	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		TUBIFICIDAE			AULODRILUS		PIGUETI
304	224	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		ENCHYTRAEIDAE			CERNOSVITOVIELLA		
305	227	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		TUBIFICIDAE			ILYODRILUS		TEMPLETONI
306	273	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		TUBIFICIDAE			LIMNODRILUS		CLAPAREDEIANUS
308	277	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		TUBIFICIDAE			LIMNODRILUS		HOFFMEISTERI
310	223	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		TUBIFICIDAE			LIMNODRILUS		UDEKEMIANUS
312	270	ANNELIDA	OLIGOCHAETA	LUMBRICULIDA		LUMBRICULIDAE			LUMBRICULUS		VARIEGATUS
314	267	ANNELIDA	OLIGOCHAETA	LUMBRICULIDA		LUMBRICULIDAE			LUMBRICULUS		
315	230	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			NAIS		COMMUNIS
316	259	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			NAIS		PSEUDOBTUSA
317	258	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			NAIS		SIMPLEX
318	235	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			STYLARIA		LACUSTRIS
319	240	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			SLAVINA		APPENDICULATA
320	268	ANNELIDA	OLIGOCHAETA	LUMBRICULIDA		LUMBRICULIDAE			STYLODRILUS		HERINGIANUS
322	239	ANNELIDA	OLIGOCHAETA	TUBIFICIDA		TUBIFICIDAE			TASSERKIDRILUS		HARMANI
324	2137	ANNELIDA	OLIGOCHAETA	TUBIFICIDA		TUBIFICIDAE			TUBIFICIDAE		
326	2138	ANNELIDA	OLIGOCHAETA	TUBIFICIDA		TUBIFICIDAE					
327	246	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			UNCINAIS		UNCINATA
328	233	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			VEIDOVSKYELLA		COMATA
329	256	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			NAIS		VARIABILIS
400	207	ANNELIDA	HIRUDINEA								
402	199	ANNELIDA	HIRUDINEA	PHARYNGOBDELLIDA		ERPOBDELLIDAE			ERPOBDELLA		PUNCTATA
404	214	ANNELIDA	HIRUDINEA			GLOSSIPHONIIDAE			GLOIOBDELLA		ELONGATA
405	195	ANNELIDA	HIRUDINEA			GLOSSIPHONIIDAE			GLOSSIPHONIA		COMPLANATA
406	211	ANNELIDA	HIRUDINEA	GNATHOBDELLIDA		HIRUDINIDAE			HAEMOPIS		MARMORATA
408	216	ANNELIDA	HIRUDINEA			GLOSSIPHONIIDAE			HELOBDELLA		STAGNALIS
409	209	ANNELIDA	HIRUDINEA	GNATHOBDELLIDA		HIRUDINIDAE			MACROBDELLA		DECORA
410	201	ANNELIDA	HIRUDINEA	PHARYNGOBDELLIDA		ERPOBDELLIDAE			NEPHELOPSIS		OBSCURA
412	190	ANNELIDA	HIRUDINEA			GLOSSIPHONIIDAE			PLACOBDELLA		
414	188	ANNELIDA	HIRUDINEA			GLOSSIPHONIIDAE			PLACOBDELLA		MULTILINEATA
416	191	ANNELIDA	HIRUDINEA			GLOSSIPHONIIDAE			PLACOBDELLA		ORNATA
418	189	ANNELIDA	HIRUDINEA			GLOSSIPHONIIDAE			PLACOBDELLA		PICTA

Appendix 4: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
500	621	ARTHROPODA	CRUSTACEA	PERACARIDA	ISOPODA						
502	622	ARTHROPODA	CRUSTACEA	PERACARIDA	ISOPODA	ASELLIDAE			ASELLUS		FORBESI
600	338	ARTHROPODA	CRUSTACEA	PERACARIDA	AMPHIPODA						
602	342	ARTHROPODA	CRUSTACEA	PERACARIDA	AMPHIPODA	CRANGONYCTIDAE			CRANGONYX		GRACILIS
604	619	ARTHROPODA	CRUSTACEA	PERACARIDA	AMPHIPODA	CRANGONYCTIDAE			CRANGONYX		LAURENTIANUS
606	339	ARTHROPODA	CRUSTACEA	PERACARIDA	AMPHIPODA	TALITRIDAE			HYALELLA		AZTECA
608	337	ARTHROPODA	CRUSTACEA	PERACARIDA	AMPHIPODA	PONTOPOREIIDAE			DIPOREIA		HOYI
700	2139	ARTHROPODA	CRUSTACEA	DECAPODA							
701	616	ARTHROPODA	CRUSTACEA	EUCARIDA	DECAPODA	CAMBARIDAE	CAMBARINAE		CAMBARUS		BARTONI
702	329	ARTHROPODA	CRUSTACEA	EUCARIDA	DECAPODA	CAMBARIDAE	CAMBARINAE		CAMBARUS	PUNCTICAMBARUS	ROBUSTUS
704	612	ARTHROPODA	CRUSTACEA	EUCARIDA	DECAPODA	CAMBARIDAE	CAMBARINAE		ORCONECTES		PROPINQUIS
706	613	ARTHROPODA	CRUSTACEA	EUCARIDA	DECAPODA	CAMBARIDAE	CAMBARINAE		ORCONECTES		VIRILIS
800	279	ARTHROPODA	ARACHNOIDEA	ACARIFORMES							
802	661	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	ARRENURIDAE			ARRENURUS	ARRENURUS	AMERICANUS
804	281	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	ARRENURIDAE			ARRENURUS	ARRENURUS	AURICULARIS
806	282	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	ARRENURIDAE			ARRENURUS	MEGARRENURUS	APETIOLATUS
808	662	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	ARRENURIDAE			ARRENURUS	MEGARRENURUS	CARDIACUS
810	659	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	ARRENURIDAE			ARRENURUS	MEGARRENURUS	MEGALURUS
812	323	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	HYDRODROMIDAE			ATRACTIDES		
814	320	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	UNIONICOLIDAE			HUITFELDTIA		RECTIPES
816	645	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	HYDRODROMIDAE			HYDRODROMA		AMERICANUS
817	649	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	HYDRODROMIDAE			HYDRODROMA		DESPICIENS
818	296	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	HYDRODROMIDAE			HYGROBATES		LONGIPALPIS
820	308	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	HYGROBATIDAE			HYGROBATES		NEOCALLIGER
822	651	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	LEBERTIIDAE			LEBERTIA		DISTINCTA
824	653	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	LIMNESIIDAE			LIMNESIA		MACULATA
826	648	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	LIMNESIIDAE			LIMNESIA		UNDULATA
827	654	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	LIMNOCHARIDAE			LIMNOCARES		
828	306	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	HYDRYPHANTIDAE			PSEUDOHYDRYPHANTES		ORBICULARIS
830	655	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	UNIONICOLIDAE			UNIONICOLA	CRASSIPES	LAURENTIANA
832	317	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	ARRENURIDAE			ARRENURUS	MEGARRENURUS	BIRGEI
834	2140	ARTHROPODA	ARACHNIDA	HYDRACARINA	ARRENURIDAE				ARRENURUS	MEGALURACARUS	ELEVATUS
900	416	ARTHROPODA	INSECTA	COLLEMBOLA							
902	430	ARTHROPODA	INSECTA	COLLEMBOLA	ARTHROPLEONA	ISOTOMIDAE			FOLSOMIA		
904	421	ARTHROPODA	INSECTA	COLLEMBOLA	ARTHROPLEONA	PODURIDAE			HYPOGASTRURA		
905	2141	ARTHROPODA	INSECTA	COLLEMBOLA	ARTHROPLEONA	PODURIDAE			HYPOGASTRURA		VIATICA
906	422	ARTHROPODA	INSECTA	COLLEMBOLA	ARTHROPLEONA	ONYCHIURIDAE			ISOTOMURUS	HYDROISOTOMA	
908	2142	ARTHROPODA	INSECTA	COLLEMBOLA	ARTHROPLEONA	ISOTOMIDAE			METISOTOMA		
1000	1186	ARTHROPODA	INSECTA	EPHEMEROPTERA							
1002	1228	ARTHROPODA	INSECTA	EPHEMEROPTERA		HEPTAGENIIDAE	ARTHROPLEINAE		ARTHROPLEA		BIPUNCTATA
1004	2143	ARTHROPODA	INSECTA	EPHEMEROPTERA		CAENIDAE			CAENIS		DIMINUTA
1005	1156	ARTHROPODA	INSECTA	EPHEMEROPTERA		CAENIDAE			CAENIS		PUNCTATA
1006	1214	ARTHROPODA	INSECTA	EPHEMEROPTERA		LEPTOPHLEBIIDAE			CHOROTERPES		BASALIS
1007	1165	ARTHROPODA	INSECTA	EPHEMEROPTERA		BAETIDAE			CLOEON		RUBROPICTUM
1008	1280	ARTHROPODA	INSECTA	EPHEMEROPTERA		EPHEMERIDAE			EPHEMERA		SIMULANS
1009	2153	ARTHROPODA	INSECTA	EPHEMEROPTERA		EPHEMERELLIDAE			EURLYOPHELLA		LUTULENTA
1012	1299	ARTHROPODA	INSECTA	EPHEMEROPTERA		EPHEMERELLIDAE			EURYLOPHELLA		BICOLOR
1014	1273	ARTHROPODA	INSECTA	EPHEMEROPTERA		EPHEMERELLIDAE			EURYLOPHELLA		TEMPORALIS
1016	1281	ARTHROPODA	INSECTA	EPHEMEROPTERA		EPHEMERIDAE			HEXAGENIA		LIMBATA
1021	1162	ARTHROPODA	INSECTA	EPHEMEROPTERA		SIPHLONURIDAE	SIPHLONURINAE		SIPHLONURUS		ALTERNATUS
1024	1187	ARTHROPODA	INSECTA	EPHEMEROPTERA		METRETOPODIDAE			SIPHLOPLECTON		BASALE

Appendix 4: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
1026	1227	ARTHROPODA	INSECTA	EPHEMEROPTERA		HEPTAGENIIDAE	HEPTAGENIINAE		STENACRON		INTERPUNCTATUM
1032	1199	ARTHROPODA	INSECTA	EPHEMEROPTERA		LEPTOPHLEBIIDAE			LEPTOPHLEBIA		INTERMEDIA
1100	1577	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	AESHNIDAE					
1101	1498	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	AESHNIDAE	AESHNINAE		AESHNA		CANADENSIS
1102	1495	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	AESHNIDAE	AESHNINAE		AESHNA		EREMITA
1104	1573	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	AESHNIDAE	AESHNINAE		AESHNA		UMBROSA
1105	1590	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	COENAGRIIDAE			ARGIA		VIOLACEA
1106	1503	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	AESHNIDAE	GOMPHAESCHINAE		BASIAESCHNA		JANATA
1108	1501	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	AESHNIDAE	GOMPHAESCHINAE		BOYERIA		GRAFIANA
1109	1559	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	LIBELLULIDAE			CELITHEMIS		EPONINA
1110	1481	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	COENAGRIIDAE			CHROMAGRION		CONDITUM
1112	1487	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	CORDULEGASTRIDAE			CORDULEGASTER		
1114	1561	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	CORDULIIDAE			CORDULIA		SHURTLEFFI
1116	1523	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	MACROMIIDAE			DIDYMOPS		TRANSVERSA
1117	2144	ARTHROPODA	INSECTA	ODONATA		GOMPHIDAE			DROMOGOMPHUS		SPINOSUS
1118	1591	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	COENAGRIIDAE			ENALLAGMA		CYATHIGERUM
1119	1592	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	COENAGRIIDAE			ENALLAGMA		BOREALE
1120	1596	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	COENAGRIIDAE			ENALLAGMA		EXSULANS
1122	1461	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	COENAGRIIDAE			ENALLAGMA		HAGENI
1124	1462	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	COENAGRIIDAE			ENALLAGMA		VESPERUM
1126	1539	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	GOMPHIDAE	HAGENIINAE		HAGENIUS		BREVISTYLUS
1128	1544	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	GOMPHIDAE	GOMPHINAE		GOMPHUS	GOMPHUS	EXILIS
1130	1474	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	COENAGRIIDAE			ISCHNURA		VERTICALIS
1132	1492	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	LIBELLULIDAE			LIBELLULA		JULIA
1133	1470	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	LESTIDAE			LESTES		DISJUNCTUS
1134	1469	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	LESTIDAE			LESTES		VIGILAX
1135	1493	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	LIBELLULIDAE			LIBELLULA		QUADRIMACULATA
1136	1581	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	LIBELLULIDAE			LEUCORRHINIA		FRIGIDA
1138	1494	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	LIBELLULIDAE			LEUCORRHINIA		HUDSONICA
1140	1579	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	LIBELLULIDAE			LIBELLULA		INCESTA
1142	1518	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	CORDULIIDAE			SOMATOCHLORA		WILLIAMSONI
1144	1519	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	CORDULIIDAE			EPITHECA		CYNOSURA
1146	1524	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	MACROMIIDAE			MACROMIA		ILLINOIENSIS
1148	2145	ARTHROPODA	INSECTA	ODONATA		AESHNIDAE			NASIAESCHNA		PENTACA
1150	1565	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	CORDULIIDAE			SOMATOCHLORA		CINGULATA
1200	1613	ARTHROPODA	INSECTA	PLECOPTERA							
1201	1650	ARTHROPODA	INSECTA	PLECOPTERA		PERLODIDAE	ISOPERLINAE		ISOPERLA		MARLYNIA
1202	1698	ARTHROPODA	INSECTA	PLECOPTERA		NEMOURIDAE			NEMOURA		TRISPINOSA
1204	2159	ARTHROPODA	INSECTA	PLECOPTERA		NEMOURIDAE	NEMOURINAE		SOYEDINA		
1300	1402	ARTHROPODA	INSECTA	HEMIPTERA		BELOSTOMATIDAE					
1301	1381	ARTHROPODA	INSECTA	HEMIPTERA		NOTONECTIDAE			BUENOA		MACROTIBIALIS
1302	1455	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			CENOCORIXA		
1303	1404	ARTHROPODA	INSECTA	HEMIPTERA		BELOSTOMATIDAE			BELOSTOMA		FLUMINIUM
1304	2146	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			CORIXIDAE		
1306	1425	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			HESPEROCORIXA		ATOPODONTA
1308	1437	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			HESPEROCORIXA		KENNICOTTI
1310	1416	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			HESPEROCORIXA		LOBATA
1312	1335	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			HESPEROCORIXA		MICHIGANENSIS
1314	1418	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			HESPEROCORIXA		VULGARIS
1315	1346	ARTHROPODA	INSECTA	HEMIPTERA		BELOSTOMATIDAE			LETHOCERUS		AMERICANUS
1316	1382	ARTHROPODA	INSECTA	HEMIPTERA		NOTONECTIDAE			NOTONECTA		INSULATA

Appendix 4: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
1318	1384	ARTHROPODA	INSECTA	HEMIPTERA		NOTONECTIDAE			NOTONECTA		UNDULATA
1319	1432	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			PALMACORIXA		BUENOI
1320	1417	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	ARCTOSIGARA	DECORATELLA
1321	1395	ARTHROPODA	INSECTA	HEMIPTERA		NEPIDAE			RANATRA		FUSCA
1322	1423	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	ARCTOSIGARA	PENNIENSIS
1324	1341	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	PHAEOSIGARA	COMPRESSOIDEA
1326	1340	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	PHAEOSIGARA	MACKINACENSIS
1328	1426	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	PHAEOSIGARA	MACROPALA
1329	2147	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	PHAEOSIGARA	MISSISSIPPIENSIS
1330	1410	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	PILEOSIGARA	DOUGLASENSIS
1332	1436	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	VERMISIGARA	DEFLECTA
1334	1421	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	VERMISIGARA	JOHNSONI
1335	1419	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	VERMICORIXA	MULLETTENSIS
1400	2157	ARTHROPODA	INSECTA	MEGALOPTERA							
1402	1615	ARTHROPODA	INSECTA	MEGALOPTERA		CORYDALIDAE			CHAULIODES		
1404	1616	ARTHROPODA	INSECTA	MEGALOPTERA		SIALIDAE			SIALIS		
1500	1604	ARTHROPODA	INSECTA	NEUROPTERA		HEMEROBIIDAE					
1502	1601	ARTHROPODA	INSECTA	NEUROPTERA		SISYRIDAE			CLIMACIA		AREOLARIS
1600	1715	ARTHROPODA	INSECTA	TRICHOPTERA							
1602	1713	ARTHROPODA	INSECTA	TRICHOPTERA		SERICOSTOMATIDAE			AGARODES		DISTINCTUS
1603	1807	ARTHROPODA	INSECTA	TRICHOPTERA		PHRYGANEIDAE	PHRYGANEINAE		AGRYPNIA		IMPROBA
1604	1773	ARTHROPODA	INSECTA	TRICHOPTERA		PHRYGANEIDAE	PHRYGANEINAE		AGRYPNIA		VESTITA
1605	1804	ARTHROPODA	INSECTA	TRICHOPTERA		PHRYGANEIDAE	PHRYGANEINAE		AGRYPNIA		STRAMINEA
1608	1811	ARTHROPODA	INSECTA	TRICHOPTERA		PHRYGANEIDAE	PHRYGANEINAE		BANKSIOLA		SMITHI
1609	1808	ARTHROPODA	INSECTA	TRICHOPTERA		PHRYGANEIDAE	PHRYGANEINAE		BANKSIOLA		CROTCHI
1610	1864	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	ARTHRISPINDINI	CERACLEA		ALCES
1611	1810	ARTHROPODA	INSECTA	TRICHOPTERA		PHRYGANEIDAE	PHRYGANEINAE		BANKSIOLA		DOSSUARIA
1612	1937	ARTHROPODA	INSECTA	TRICHOPTERA		HYDROPTILIDAE	HYDROPTILINAE		HYDROPTILA		
1613	1861	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	ARTHRISPINDINI	CERACLEA		
1614	1909	ARTHROPODA	INSECTA	TRICHOPTERA		LEPIDOSTOMATIDAE			LEPIDOSTOA		
1615	1925	ARTHROPODA	INSECTA	TRICHOPTERA		HYDROPSYCHIDAE	DIPLECTRONINAE		DIPLECTRONA		MODESTA
1616	1981	ARTHROPODA	INSECTA	TRICHOPTERA		PSYCHOMYIIDAE	PSYCHOMYIINAE		LYPE		DIVERSA
1618	1758	ARTHROPODA	INSECTA	TRICHOPTERA		MOLANNIDAE			MOLANNA		ULMERINA-UNIOPHILA
1619	1899	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE			LEPTOCERIDAE		
1620	1932	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	MYSTACIDINI	MYSTACIDES		SEPULCHRALIS
1622	1862	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	LEPTOCERINI	NECTOPSYCHE		
1624	2148	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	LEPTOCERINI	NECTOPSYCHE		SP 2
1626	2149	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	LEPTOCERINI	NECTOPSYCHE		SP. 3
1627	1827	ARTHROPODA	INSECTA	TRICHOPTERA		LIMNEPHILIDAE	LIMNEPHILINAE	LIMNOPHILINI	NEMOTAULIUS		HOSTILIS
1628	1967	ARTHROPODA	INSECTA	TRICHOPTERA		POLYCENTROPODIDAE	POLYCENTROPODINAE		NYCTIOPHYLAX		AFFINIS
1630	1865	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	OECETINI	OECETIS		CINERASCENS
1632	1929	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	OECETINI	OECETIS		
1642	2150	ARTHROPODA	INSECTA	TRICHOPTERA		HYDROPTILIDAE	HYDROPTILINAE		OXYETHIRA		SP. 2
1644	2230	ARTHROPODA	INSECTA	TRICHOPTERA		HYDROPTILIDAE	HYDROPTILINAE		OXYETHIRA		SP. 3
1645	1799	ARTHROPODA	INSECTA	TRICHOPTERA		PHRYGANEIDAE	PHRYGANEINAE		PHRYGANEA		
1646	2156	ARTHROPODA	INSECTA	TRICHOPTERA		HYDROPTILIDAE	HYDROPTILINAE		OXYETHIRA		SP. 4
1648	1983	ARTHROPODA	INSECTA	TRICHOPTERA		POLYCENTROPODIDAE	DISPSEUDOPSINAE		PHYLOCENTROPUS		
1650	1885	ARTHROPODA	INSECTA	TRICHOPTERA		LIMNEPHILIDAE	LIMNEPHILINAE	LIMNEPHILINI	PLATYCENTROPUS		
1652	2231	ARTHROPODA	INSECTA	TRICHOPTERA		POLYCENTROPODIDAE	POLYCENTROPODINAE		POLYCENTROPUS		SP. 1
1654	2232	ARTHROPODA	INSECTA	TRICHOPTERA		POLYCENTROPODIDAE	POLYCENTROPODINAE		POLYCENTROPUS		SP. 2

Appendix 4: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
1656	1798	ARTHROPODA	INSECTA	TRICHOPTERA		PHRYGANEIDAE	PHRYGANEINAE		PTILOSTOMIS		OCELLIFERA
1658	1889	ARTHROPODA	INSECTA	TRICHOPTERA		LIMNEPHILIDAE	LIMNEPHILINAE	LIMNEPHILINI	PYCNOPSYCHE		
1662	1933	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	MYSTACIDINI	TRIAENODES		SP. 1
1664	1933	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	MYSTACIDINI	TRIAENODES		SP 2
1666	1873	ARTHROPODA	INSECTA	TRICHOPTERA		LIMNEPHILIDAE			LIMNEPHILIDAE		
1700	2233	ARTHROPODA	INSECTA	LEPIDOPTERA							
1701	2236	ARTHROPODA	INSECTA	LEPIDOPTERA		PYRALIDAE	SCHOENOBIINAE		ACENTRIA		SP. 3
1702	2234	ARTHROPODA	INSECTA	LEPIDOPTERA		PYRALIDAE	SCHOENOBIINAE		ACENTRIA		SP. 1
1703	2235	ARTHROPODA	INSECTA	LEPIDOPTERA		PYRALIDAE	SCHOENOBIINAE		ACENTRIA		SP. 2
1704	1623	ARTHROPODA	INSECTA	LEPIDOPTERA		PYRALIDAE	CRAMBINAE		CRAMBUS		
1705	2237	ARTHROPODA	INSECTA	LEPIDOPTERA		PYRALIDAE	CRAMBINAE		CRAMBUS		SP. 2
1706	1705	ARTHROPODA	INSECTA	LEPIDOPTERA		GEOMETRIDAE			GEOMETRIDAE		
1708	2238	ARTHROPODA	INSECTA	LEPIDOPTERA		PYRALIDAE	NYMPHULINAE		EOPARARGYRACTIS		
1709	1621	ARTHROPODA	INSECTA	LEPIDOPTERA		PYRALIDAE	NYMPHYLINAE		PARAPONYX		
1800	2239	ARTHROPODA	INSECTA	COLEOPTERA							
1801	410	ARTHROPODA	INSECTA	COLEOPTERA		DYTISCIDAE			AGABUS		ANTHRACINUS
1802	2240	ARTHROPODA	INSECTA	COLEOPTERA		DYTISCIDAE			AGABUS		
1803	517	ARTHROPODA	INSECTA	COLEOPTERA		DYTISCIDAE			AGABUS		
1804	448	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			DINEUTUS		HORNI
1806	450	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			DINEUTUS		NIGRIOR
1808	571	ARTHROPODA	INSECTA	COLEOPTERA		CHRYSOMELIDAE			DONACIA		
1810	592	ARTHROPODA	INSECTA	COLEOPTERA		ELMIDAE			DUBIRAPHIA		MINIMA-VITATTA
1812	477	ARTHROPODA	INSECTA	COLEOPTERA		PSEPHENIDAE			ECTOPRIA		NERVOSA
1814	457	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			GYRINUS		AFFINIS
1815	362	ARTHROPODA	INSECTA	COLEOPTERA		DYTISCIDAE			GRAPHODERUS		LIBERUS
1816	461	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			GYRINUS		FROSTI
1817	2241	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			GYRINUS		AERATUS
1818	463	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			GYRINUS		LATILIMBUS
1820	462	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			GYRINUS	SAYI	(=LUGENS)
1822	442	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			GYRINUS		PECTORALIS
1824	467	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			GYRINUS		VENTRALIS
1828	490	ARTHROPODA	INSECTA	COLEOPTERA		HALIPLIDAE			HALIPLUS		PANTHERINUS
1830	348	ARTHROPODA	INSECTA	COLEOPTERA		HYDROPHILIDAE			HYDROCHUS		
1832	374	ARTHROPODA	INSECTA	COLEOPTERA		DYTISCIDAE			HYDROPORUS	NEOPORUS	UNDULATUS
1834	527	ARTHROPODA	INSECTA	COLEOPTERA		ELMIDAE			MACRONYCHUS		GLABRATUS
1836	478	ARTHROPODA	INSECTA	COLEOPTERA		MELYRIDAE			MELYRIDAE		
1837	2242	ARTHROPODA	INSECTA	COLEOPTERA		STAPHYLINIDAE			PHYTOSUS		
1838	485	ARTHROPODA	INSECTA	COLEOPTERA		HELODIDAE			PRIONOCYPHON		
1840	2243	ARTHROPODA	INSECTA	COLEOPTERA		SCIRTIDAE			SCIRTES		SP. 1
1842	2244	ARTHROPODA	INSECTA	COLEOPTERA		SCIRTIDAE			SCIRTES		SP. 2
1844	2245	ARTHROPODA	INSECTA	COLEOPTERA		SCIRTIDAE			SCIRTES		SP. 3
1846	573	ARTHROPODA	INSECTA	COLEOPTERA		ELMIDAE			STENELMIS		CRENATA
1848	345	ARTHROPODA	INSECTA	COLEOPTERA		HYDROPHILIDAE			BEROSUS		
1850	390	ARTHROPODA	INSECTA	COLEOPTERA		DYTISCIDAE			COPTOTOMUS		LONGULUS
1852	480	ARTHROPODA	INSECTA	COLEOPTERA		HELODIDAE			CYPHON		
1854	347	ARTHROPODA	INSECTA	COLEOPTERA		HYDROPHILIDAE			TROPISTERNUS		MIXTUS
1856	525	ARTHROPODA	INSECTA	COLEOPTERA		ELATERIDAE			ELATERIDAE		

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MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
2000	433	ARTHROPODA	INSECTA	DIPTERA							
2100	882	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE					
2101	763	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		ALLUAUDOMYIA		
2102	754	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	FORCIPOMYIINAE		ATRICHOPOGON		POLYDACTYLUS
2104	2216	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP 1
2106	2218	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP 1A
2108	2219	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP. 2/2A
2110	2220	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP. 3
2112	2221	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP. 4
2114	2152	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP. 5
2116	2222	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP. 6
2117	2224	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP. 8
2118	2223	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP. 7
2120	766	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		CULICOIDES		STELLIFER
2122	2225	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		CULICOIDES		SP. 1
2124	2226	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		CULICOIDES		SP. 2
2126	755	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	FORCIPOMYIINAE		FORCIPOMYIA		
2128	2227	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	DASYHELEINAE		DASYHELEA		SP. 1
2130	2228	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	DASYHELEINAE		DASYHELEA		SP 2
2132	695	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		MALLOCHOHELEA		
2133	2229	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	DASYHELEINAE		DASYHELEA		SP. 3
2136	694	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE			MONOHELEA		
2140	696	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE			ISOHELEA		
2142	770	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		PALPOMYIA		TIBIALIS
2144	771	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		PALPOMYIA		SP.2
2146	2208	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		PROBEZZIA		SP. 1
2148	2209	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		PROBEZZIA		SP. 2
2150	2210	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		PROBEZZIA		SP. 3
2152	2211	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		PROBEZZIA		SP. 4
2153	2212	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		PROBEZZIA		SP. 5
2154	683	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		STILOBEZZIA		
2155		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		PROBEZZIA		SP. 6
2200	2003	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE					
2300	842	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	PODONOMINAE	PODONOMINI			
2302	724	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	PODONOMINAE	PODONOMINI	PAROCHLUS		KIEFFERI
2400	547	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE				
2401	898	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	ABLABESMYIA	ABLABESMYIA	MALLOCHI
2402	721	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	ABLABESMYIA	ABLABESMYIA	ASPERA
2403	2213	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE		ABLABESMYIA	ASAYIA	ANNULATA
2404	805	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	MACROPELOPIINI	APSECTROTANYPUS		JOHNSONI
2405	897	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	ABLABESMYIA	ABLABESMYIA	PARAJANTA
2406	546	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE		BRUNDINELLA		EUMORPHA
2407	2020	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	ABLABESMYIA	ABLABESMYIA	MONILIS
2408	549	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	COELOTANYPODINI	CLINOTANYPUS		PINGUIS
2409	2214	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE		ABLABESMYIA	KARELIA	ILLINOENSIS
2410	811	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	CONCHAPELOPIA		
2411	798	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	ABLABESMYIA	ABLABESMYIA	PEELENSIS
2412	548	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	MACROPELOPIINI	DJALMABATISTA		PULCHER
2414	809	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	GUTTIPELOPIA		GUTTIPENNIS
2416	552	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	LABRUNDINIA		PILOSELLA

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MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
2418	814	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	LABRUNDINIA		NEOPILOSELLA
2419	800	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	LABRUNDINIA		
2420	813	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	LARSIA		CANADENSIS
2422	550	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	LARSIA		INDISTINCTA
2424	812	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	NATARSIA		BALTIMOREUS
2426	802	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	MACROPELOPIINI	PROCLADIUS		
2428	796	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	THIENEMANNIMYIA		NORENA
2430	2018	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	TRISSOPELOPIA		OGEMAWI
2432	2215	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE		ZAVRELIMYIA		SP. 1
2434	2203	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE		ZAVRELIMYIA		
2500	714	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	DIAMESINAE	DIAMESINI			
2501	802	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	MACROPELOPIINI	PROCLADIUS		
2502	2204	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	DIAMESINAE		PROTANYPUS		RAMOSUS
2503	857	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	DIAMESINAE	PROTANYPINI	PROTANYPUS		RAMOSUS
2600	711	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	DIAMESINAE	PRODIAMENSINI			
2602	710	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	DIAMESINAE	PRODIAMENSINI	MONODIAMESA		BATHYPHILA
2700	840	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE				
2702	725	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		ACRIOTOPUS		
2704	839	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		BRILLIA		PARVA
2706	838	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		BRYOPHAENOCLADIUS		
2708	1327	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CORYNONEURA		LACUSTRIS
2710	1328	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CORYNONEURA		LOBATA
2711		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		BRILLIA		FLAVIFRONS
2712	539	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CORYNONEURA		SCUTELLATA
2714	2205	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CORYNONEURA		SP. 1
2716	2206	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CORYNONEURA		SP. 2
2717	2207	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CORYNONEURA		SP. 3
2718	1711	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	CRICOTOPUS	ALBIFORCEPS
2719	1136	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS		
2720	500	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	CRICOTOPUS	CYLINDRACEUS
2722	502	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	CRICOTOPUS	FESTIVELLUS
2724	501	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	CRICOTOPUS	CURTUS
2726	438	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	CRICOTOPUS	TREMULUS
2728	437	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	ISOCLADIUS	INTERSECTUS
2730	823	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	ISOCLADIUS	LARICOMALIS
2732	2155	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	ISOCLADIUS	SP. 1
2733	2154	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	ISOCLADIUS	SP. 2
2734	1709	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		DIPLOCLADIUS		
2736	1708	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		DOITHRIX		SP. 1
2737	2190	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		EPOICOCLADIUS		SP. 1
2738	1708	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		DOITHRIX		SP. 2
2739	822	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		EPOICOCLADIUS		FLAVENS
2740	496	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		HELENIELLA		
2742	675	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		HETEROTANYTARSUS		NUDALUS
2744	676	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		HETEROTRISSOCLADIUS		CHANGI
2746	677	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		HETEROTRISSOCLADIUS		HIRTAPEX
2748	821	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		HYDROBAENUS		FUSISTYLUS
2749		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		NANOCLADIUS		DISTINCTUS
2750	680	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		LIMNOPHYES		
2751	681	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		NANOCLADIUS	NANOCLADIUS	INCOMPTUS
2752	719	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		NANOCLADIUS	NANOCLADIUS	MINIMUS
2753		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		NANOCLADIUS	PLECOPTERACOLUTHUS	DOWNSEI

Appendix 4: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
2754	2191	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		NANOCLADIUS	NANOCLADIUS	
2755		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARACRICOPTUS		
2756	1143	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		ORTHOCLADIUS	ORTHOCLADIUS	ANNECTENS
2757	2192	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARACLADIUS		
2758	2193	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARAKIEFFERIELLA		SP. 1
2759	2194	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARAKIEFFERIELLA		SP. 2
2760	2195	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARAKIEFFERIELLA		SP. 3
2761	2196	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARAKIEFFERIELLA		SP. 4
2762	1138	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARAMETRIOCNEMUS		LUNDBECKI
2764	1141	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARAPHAENOCLADIUS		NATHECUS
2766	1140	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARAPHAENOCLADIUS		
2768	1144	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PLATYSMITTIA		
2769	2197	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSECTROCLADIUS	ALLOPSECTROCLADIUS	
2770	1727	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSECTROCLADIUS	MESOPSECTROCLADIUS	
2772	891	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSECTROCLADIUS	MONOPSECTROCLADIUS	CALCARATUS
2774	1729	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSECTROCLADIUS	PSECTROCLADIUS	LITOFILUS
2776	674	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSECTROCLADIUS	PSECTROCLADIUS	SIMULANS
2777	666	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSECTROCLADIUS	PSECTROCLADIUS	SORDIDELLUS
2778	1132	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSEUDORTHOCLADIUS		
2780	1131	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSEUDOSMITTIA		FORCIPATA
2781	2199	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSEUDOSMITTIA		SP. 2
2782	2198	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSEUDOSMITTIA		SP. 1
2784	667	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		RHEOCRICOTOPUS		
2786	1129	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		SMITTIA		
2788	1724	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		STACKELBERGINA		
2790	720	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		SYNORTHOCLADIUS		SEMIVIRENS
2792	1324	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		THIENEMANNIELLA		
2794	1325	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		TVETANIA		BAVARICA
2796	884	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		TVETANIA		DISCOLORIPES
2797	818	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		XYLOTOPUS		
2798	817	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		ZALUTSCHIA		OBSEPTA
2799	819	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		ZALUTSCHIA		SP. 1
2800	1120	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE				
2900	1120	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI			
2902	1113	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	CLADOPELMA		
2904	793	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	CHIRONOMUS	CAMPTOCHIRONOMUS	TENTANS
2906	669	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	CHIRONOMUS		
2908	1999	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	CRYPTOCHIRONOMUS		CONUS
2910	2001	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	CRYPTOCHIRONOMUS		
2912	787	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	DEMICRYPTOCHIRONOMUS	IRMAKIA	CUNEATUS
2914	791	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	DICROTENDIPES		LEUCOSCELIS
2916	878	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	DICROTENDIPES		MODESTUS
2917	2200	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	DICROTENDIPES		NERVOSUS
2918	786	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	DICROTENDIPES		TRITOMUS
2920	876	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	ENDOCHIRONOMUS		NIGRICANS
2922	2201	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	GLYPTOTENDIPES		SP. 1
2923	2202	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	GLYPTOTENDIPES		SP. 2
2924	2177	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	GLYPTOTENDIPES		
2925	2178	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	KIEFFERULUS		DUX

Appendix 4: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
2926	1119	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	LAUTERBORNIELLA		AGRAYLOIDES
2927		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	GLYPTOTENDIPES		SP. 3
2928	1112	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	MICROTENDIPES		PEDELLUS
2930	784	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	NILOTHAUMA		BABIYI
2932	785	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	NILOTHAUMA		
2935	1117	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	OMISUS		CALEDONICUS
2936	783	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	OMISUS		PICA
2938	1125	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PAGASTIELLA		OSTANSA
2940	1127	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARACHIRONOMUS		ABORTIVUS
2942	778	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARACLADOPELMA		GALAPTERA
2944	690	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARACLADOPELMA		UNDINE
2946	854	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARACLADOPELMA		
2948	1106	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARALAUTERBORNIELLA		NIGROHALTERALIS
2950	1319	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARATENDIPES		ALBIMANUS
2952	1320	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARATENDIPES		NUDISQUAMA
2954	693	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PHAENOPSECTRA		
2956	895	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	PENTAPEDILUM	SORDEN
2958	1323	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	PENTAPEDILUM	TRITUM
2960	691	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		CONVICTUM
2962	2179	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP. 1
2964	2180	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP. 2
2966	2182	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP. 3
2968	2183	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP. 4
2970	779	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	TRIPODURA	SCALAENUM
2972	1321	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	TRIPODURA	SIMULANS
2974	855	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PSEUDOCHIRONOMUS		ARTICAUDUS
2975	2189	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PSEUDOCHIRONOMUS		SP. 1
2976	2163	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PSEUDOCHIRONOMUS		SP. 2
2977	2164	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PSEUDOCHIRONOMUS		SP. 3
2978	890	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	SERGENTIA		CORACINA
2979	2165	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PSEUDOCHIRONOMUS		SP. 4
2980	1105	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	STENOCHIRONOMUS		HILARIS
2982	879	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	STICTOCHIRONOMUS		SP.1/3
2984	692	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PHAENOPSECTRA		FLAVIPES
2986	835	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	TRIBELOS		JUCUNDUM
2988	2167	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	ZAVRELIELLA		MARMORATA
2990	2185	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	POLYPEDILUM	FALLAX
2991	1322	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	POLYPEDILUM	ILLINOENSE
2992	2186	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	POLYPEDILUM	TRIGONUM
2993	2181	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP 2A
2994	2184	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP. 5
2995	2187	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	TRIPODURA	SP. 1
2996	2166	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	STICTOCHIRONOMUS		SP. 2
2997	836	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	XENOCHIRONOMUS		XENOLABIS
2999	2188	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	TRIPODURA	SP. 2
3000	706	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI			
3002	867	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	CLADOTANYTARSUS		

Appendix 4: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
2926	1119	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	LAUTERBORNIELLA		AGRAYLOIDES
2927		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	GLYPTOTENDIPES		SP. 3
2928	1112	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	MICROTENDIPES		PEDELLUS
2930	784	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	NILOTHAUMA		BABIYI
2932	785	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	NILOTHAUMA		
2935	1117	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	OMISUS		CALEDONICUS
2936	783	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	OMISUS		PICA
2938	1125	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PAGASTIELLA		OSTANSA
2940	1127	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARACHIRONOMUS		ABORTIVUS
2942	778	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARACLADOPELMA		GALAPTERA
2944	690	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARACLADOPELMA		UNDINE
2946	854	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARACLADOPELMA		
2948	1106	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARALAUTERBORNIELLA		NIGROHALTERALIS
2950	1319	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARATENDIPES		ALBIMANUS
2952	1320	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARATENDIPES		NUDISQUAMA
2954	693	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PHAENOPSECTRA		
2956	895	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	PENTAPEDILUM	SORDEN
2958	1323	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	PENTAPEDILUM	TRITUM
2960	691	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		CONVICTUM
2962	2179	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP 1
2964	2180	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP 2
2966	2182	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP 3
2968	2183	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP 4
2970	779	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	TRIPODURA	SCALAENUM
2972	1321	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	TRIPODURA	SIMULANS
2974	855	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PSEUDOCHIRONOMUS		ARTICAUDUS
2975	2189	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PSEUDOCHIRONOMUS		SP. 1
2976	2163	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PSEUDOCHIRONOMUS		SP 2
2977	2164	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PSEUDOCHIRONOMUS		SP 3
2978	890	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	SERGENTIA		CORACINA
2979	2165	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PSEUDOCHIRONOMUS		SP. 4
2980	1105	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	STENOCHIRONOMUS		HILARIS
2982	879	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	STICTOCHIRONOMUS		SP 1/3
2984	692	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PHAENOPSECTRA		FLAVIPES
2986	835	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	TRIBELOS		JUCUNDUM
2988	2167	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	ZAVRELIELLA		MARMORATA
2990	2185	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	POLYPEDILUM	FALLAX
2991	1322	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	POLYPEDILUM	ILLINOENSE
2992	2186	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	POLYPEDILUM	TRIGONUM
2993	2181	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP 2A
2994	2184	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP. 5
2995	2187	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	TRIPODURA	SP. 1
2996	2166	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	STICTOCHIRONOMUS		SP. 2
2997	836	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	XENOCHIRONOMUS		XENOLABIS
2999	2188	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	TRIPODURA	SP 2
3000	706	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI			
3002	867	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	CLADOTANYTARSUS		
3004	864	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	PARAPSECTRA		
3006	866	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	PARATANYTARSUS		
3008	873	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	STEMPELLINA		

Appendix 4: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
3010	871	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	STEMPELLINELLA		
3012	700	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	TANYTARSUS		CURTICORNIS
3014	863	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	TANYTARSUS		
3016	2168	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	CHIRONOMIDAE		
3018	869	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	ZAVRELIA		
3100	731	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	TABANIDAE					
3102	961	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	TABANIDAE			CHRYSOPS		ATER
3103	831	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	TABANIDAE			CHRYSOPS		EXCITANS
3104	2169	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	TABANIDAE			CHRYSOPS		SP. 1
3106	2158	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	TABANIDAE			CHRYSOPS		
3108	2170	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	TABANIDAE			TABANUS		
3109	2171	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	TABANIDAE			TABANUS		MARGINALIS
3200	1237	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE					
3202	1258	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE	LIMONIINAE		DACTYLOLABIS		
3204	1265	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE	LIMONIINAE		HEXATOMA		
3206	1033	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE	LIMONIINAE		LIMONIA		
3208	1145	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE	LIMONIINAE		ERIOPTERA		
3210	1064	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE	LIMONIINAE		ORMOSIA		
3211	1250	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE	LIMONIINAE		PEDICIA		
3212	2172	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE			TIPULA		SP. 1
3214	1244	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE	TIPULINAE		TIPULA	NIPPOTIPULA	ABDOMINALIS
3216	2173	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE			TIPULA	YAMATOTIPULA	
3217	2174	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE			TIPULIDAE		SP. 1
3218	2151	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE			TIPULIDAE		SP. 2
3220	1262	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE	LIMONIINAE		GONOMYIA		
3302	2176	ARTHROPODA	INSECTA	DIPTERA		CECIDOMYIIDAE			CECIDOMYIIDAE		
3306	716	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	DIXIDAE			DIXELLA		
3308	2128	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	DOLICHOPODIDAE			DOLICHOPODIDAE		
3310	827	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	EMPIDIDAE			HEMERODROMIA		
3311	940	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	EMPIDIDAE			EMPIDIDAE		
3312	2160	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	PHORIDAE			PHORIDAE		
3314	2161	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	PLATYPEZIDAE			PLATYPEZA		SP. 1
3316	2162	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	PLATYPEZIDAE			PLATYPEZA		SP. 2
3318	1016	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	PTYCHOPTERIDAE			BATTACOMORPHA		
3320	1101	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	PSYCHODIDAE			PSYCHODIDAE		
3322	1238	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	THAUMALEIDAE			THAUMALEA		
3500	2027	MOLLUSCA	GASTROPODA								
3502	2064	MOLLUSCA	GASTROPODA	MESOGASTROPODA		HYDROBIIDAE			AMNICOLA		LIMOSA
3503	2061	MOLLUSCA	GASTROPODA	MESOGASTROPODA		VIVIPARIDAE			CAMPELOMA		DECISUM
3504	2036	MOLLUSCA	GASTROPODA	BASOMMATOPHORA		ANCYLIDAE			FERRISSIA		FRAGILIS
3505	2059	MOLLUSCA	GASTROPODA	BASOMMATOPHORA		PLANORBIDAE			GYRAULUS		PARVUS
3506	2040	MOLLUSCA	GASTROPODA	BASOMMATOPHORA		PSYSIDAE			PHYSELLA	PHYSELLA	GYRINA
3508	2044	MOLLUSCA	GASTROPODA	BASOMMATOPHORA		PLANORBIDAE			HELISOMA		ANCEPS
3510	2029	MOLLUSCA	GASTROPODA	BASOMMATOPHORA		PLANORBIDAE			PLANORBULA		CAMPESTRIS
3512	2060	MOLLUSCA	GASTROPODA	MESOGASTROPODA		VALVATIDAE			VALVATA		LEWISI
3600	2077	MOLLUSCA	PELECYPODA								
3602	2092	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	PISIDIINAE		PISIDIUM		CASERTANUM
3604	2090	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	PISIDIINAE		PISIDIUM		FERRUGINEUM
3606	2086	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	PISIDIINAE		PISIDIUM		LILLJEBORGI
3608	2093	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	PISIDIINAE		PISIDIUM		ADAMSI
3610	2080	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	PISIDIINAE		PISIDIUM		NITIDUM

Appendix 4: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
3612	2081	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	PISIDIINAE		PISIDIUM		VARIABILE
3614	2089	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	PISIDIINAE		PISIDIUM		EQUILATERALE
3616	2102	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	SPHAERIINAE		MUSCULIUM		SECURIS
3618	2083	MOLLUSCA	PELECYPODA	VENEROIDA		UNIONIDAE			ANODONTA		
3620	2088	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	PISIDIINAE		PISIDIUM		SUBTRUNCATUM
3622	2079	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	SPHAERIINAE		MUSCULIUM	LACUSTRE	JAYENSE
3700	760	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHAOBORIDAE					
3702	685	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHAOBORIDAE	CHAOBORINAE		CHAOBORUS	CHAOBORUS	AMERICANUS
3704	684	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHAOBORIDAE	CHAOBORINAE		CHAOBORUS	CHAOBORUS	FLAVICANS
3706		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHAOBORIDAE	CHAOBORINAE		CHAOBORUS	SAYOMYIA	PUNCTIPENNIS
3800	604	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CULICIDAE					
3801	2175	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CULICIDAE			MANSONIA		PERTUBANS

APPENDIX 5

FALL 1989 BENTHIC GENERA LISTS FOR EACH LAKE

BLUE CHALK LAKE NOV 25 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
TURBELLARIA	7					7	1.4	3.1
Dugesia	7					7	1.4	3.1
NEMATODA	10	3	6			19	3.8	4.3
Anatonchus	8	1	4			13	2.6	3.4
Mermithidae	2	2	2			6	1.2	1.1
OLIGOCHAETA	70	21	11	3	8	113	22.6	27.3
Enchytraeidae	37	9	2		5	53	10.6	15.1
Ilyodrilus		3				3	0.6	1.3
Lumbriculus	11			3	1	15	3.0	4.6
Slavania	2	1				3	0.6	0.9
Stylaria			4			4	0.8	1.8
Tubificidae + hairs	20	8	5		2	35	7.0	7.9
HIRUDINEA				2		2	0.4	0.9
Helobdella				2		2	0.4	0.9
AMPHIPODA	185	194	222	132	181	914	182.8	32.6
Crangonyx					1	1	0.2	0.4
Hyalella	185	194	222	132	180	913	182.6	32.6
EPHEMEROPTERA	88	26	87	68	29	298	59.6	30.4
Caenis	10	9	6	1	2	28	5.6	4.0
Ephemera	6			1		7	1.4	2.6
Eurylophella	33	2	22	23	6	86	17.2	12.9
Hexagenia		1			1	2	0.4	0.5
Leptophlebia	38	12	54	41	20	165	33.0	16.9
Stenacron	1	2	3	2		8	1.6	1.1
Stenonema			2			2	0.4	0.9
ODONATA	12	3	17	6	9	47	9.4	5.4
Boyeria			1			1	0.2	0.4
Enallagma	6	2	10	3	8	29	5.8	3.0
Tetragonuria			1			1	0.2	0.4
Hagenius	3					3	0.6	1.3
Gomphus	3	1	2	1	1	8	1.6	0.9
Ischnura			1			1	0.2	0.4
Leucorrhinia			1			1	0.2	0.4
Libellula			1	2		3	0.6	0.9
PLECOPTERA	1					1	0.2	0.4
Isoperla	1					1	0.2	0.4
HEMIPTERA			1			1	0.2	0.4
Sigara			1			1	0.2	0.4
TRICHOPTERA	12	5	13	22	12.0	64.0	12.8	6.1
Agarodes	1				2	3	0.6	0.9
Molanna		2	1			3	0.6	0.9
Mystacides	4		1	4	4	13	2.6	1.9
Nectopsyche	1	3		4		8	1.6	1.8
Oecetis	2		1		1	4	0.8	0.7
Oxyethira					1	1	0.2	0.4
Polycentropus	3		1	1	2	7	1.4	1.1
Ptilostomis			2			2	0.4	0.9
Pycnopsyche	1		7	13	1	22	4.4	5.5
Triaenodes					1	1	0.2	0.4
COLEOPTERA	65	10	28	2	4	109	21.8	26.2
Dubiraphia	11	5	16			32	6.4	7.3
Ectopria	3					3	0.6	1.3
Hydroporus				1		1	0.2	0.4
Macronychus		1	3	1		5	1.0	1.2
Stenelmis	51	4	9		4	68	13.6	21.1

BLUE CHALK LAKE NOV 25 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
DIPTERA	382	248	166	112	279	1187	237.4	104.4
DIPTERA:Ceratopogonidae	39	8	4		2	53	10.6	16.1
Bezzia	5	1	2		2	10	2	1.7
Dasyhelea	2					2	0.4	0.9
Palpomyia		1				1	0.2	0.4
Probezzia	32	6	2			40	8	12.2
DIPTERA:Chironomidae	341	240	162	112	276	1131	226.2	90.8
Subfam.-Tanypodinae	210	138	89	36	161	634	126.8	66.9
Ablabesmyia	23	37	15	18	9	102	20.4	9.5
Conchapelopia	13	3	14	7	20	57	11.4	6.6
Djalmabatista	21	15			46	82	16.4	19.0
Labrundinia			4	2		6	1.2	1.6
Larsia	140	51	42	3	69	305	61.0	50.3
Procladius	9	19	9	4	16	57	11.4	6.0
Thienemannimyia	1	1	2		1	5	1.0	0.7
Zavrelimyia	3	12	3	2		20	4.0	4.6
Subfam.-Orthocladiinae	17	13	7	13	17	67	13.4	4.1
Corynoneura		1		3		4	0.8	1.3
Epoicocladius		1				1	0.2	0.4
Heterotrissocladius	4	6			7	17	3.4	2.9
Parakiefferiella	9		1	1	1	12	2.4	3.7
Psectrocladius	3	2	3	7	9	24	4.8	2.7
Xylotopus		1				1	0.2	0.4
Zalutschia	1	2	3	2		8	1.6	1.1
Subfam.-Chironominae	114	89	66	63	98	430	86.0	21.6
Tribe-Chironomini	21	76	24	34	43	198	39.6	22.1
Cryptochironomus	4	4	4		2	14	2.8	1.8
Demicryptochironomus	2					2	0.4	0.9
Dicrotendipes	7	2	3	3	21	36	7.2	7.1
Glyptotendipes		1				1	0.2	0.4
Lauterborniella	3	4	3	3	2	15	3.0	0.7
Microtendipes		1	4	5	4	14	2.8	2.2
Nilothauma				1	2	3	0.6	0.9
Pagastiella	1	20	4	2		27	5.4	8.3
Paratendipes					1	1	0.2	0.4
Phaenopsectra		2		1		3	0.6	0.9
Polypedilum	1	33	2	2	1	39	7.8	12.6
Pseudochironomus	1	1	1	1	8	12	2.4	2.8
Stenochironomus				1	1	2	0.4	0.5
Stictochironomus	2					2	0.4	0.9
Tribelos		8	3	15	1	27	5.4	6.2
Tribe-Tanytarsini	93	13	42	29	55	232	46.4	30.3
Cladotanytarsus	48		2	1	23	74	14.8	20.9
Paratanytarsus	6	1	1		8	16	3.2	3.6
Stempellina	10				20	30	6.0	8.9
Stempellinella	3	1				4	0.8	1.3
Tanytarsus/Micropsectra	26	11	39	28	4	108	21.6	12.5
DIPTERA:Misc.	2				1	3	0.6	0.9
Empididae:Hemerodromia	2				1	3	0.6	0.9
GASTROPODA	1			1	1	3	0.6	0.5
Amnicola	1				1	2	0.4	0.5
Ferrissia				1		1	0.2	0.4
BIVALVIA	12	2	3	2	1	20	4.0	4.5
Musculium			1			1	0.2	0.4
Pisidium	12	2	2	1	1	18	3.6	4.2

CLEAR LAKE NOV 8 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
	sub	sub	sub		sub			
NEMATODA		1	1	1	1	4	0.8	0.4
Anatonchus			1			1	0.2	0.4
Mermithidae		1		1	1	3	0.6	0.5
OLIGOCHAETA	8	38	6	17		69	13.8	14.8
Enchytraeidae	2	24	2	13		41	8.2	10.2
Lumbriculus	6	13		4		23	4.6	5.4
Tubificidae + hairs		1	4			5	1.0	1.7
HIRUDINEA	2					2	0.4	0.9
Erpobdella	2					2	0.4	0.9
AMPHIPODA	74	814	498	920	180	2486	497.2	373.8
Crangonyx	59	43	18	45	13	178	35.6	19.4
Hyalella	15	771	480	875	167	2308	461.6	371.9
EPHEMEROPTERA	207	111	24	213	29	584	116.8	91.8
Caenis	1	6	1	110	20	138	27.6	46.7
Eurylophella	189	69	9	65	4	336	67.2	74.5
Hexagenia		7				7	1.4	3.1
Leptophlebia	15	18	14	35	3	85	17.0	11.6
Stenonema	2	11		3	2	18	3.6	4.3
ODONATA	4	7	38	20	16	85	17.0	13.4
Aeshna		1			1	2	0.4	0.5
Basiaeschna		1				1	0.2	0.4
Boyeria	1					1	0.2	0.4
Celithemis			12	2	4	18	3.6	5.0
Enallagma			19	4		23	4.6	8.2
Tetragonuria		1				1	0.2	0.4
Hagenius				1		1	0.2	0.4
Gomphus	3	4	5	12	1	25	5.0	4.2
Ischnura					2	2	0.4	0.9
Libellula					7	7	1.4	3.1
Macromia				1		1	0.2	0.4
Somatochlora			2		1	3	0.6	0.8
MEGALOPTERA		3	3		13	19	3.8	5.4
Sialis		3	3		13	19	3.8	5.4
TRICHOPTERA	32	97	82	42	22	275	55.0	32.7
Agarodes	6	12	19	3	1	41	8.2	7.3
Banksiola		1			8	9	1.8	3.5
Hydroptila					1	1	0.2	0.4
Lepidostoma		6				6	1.2	2.7
Molanna	6	12	2	6	2	28	5.6	4.1
Mystacides		13	20	1		34	6.8	9.2
Nectopsyche		3	1	2		6	1.2	1.2
Nyctiophylax		2				2	0.4	0.9
Oecetis	2	15	25	7	6	55	11.0	8.2
Oxyethira	2		1			3	0.6	0.8
Polycentropus	1		2	8		11	2.2	3.3
Ptilostomis	1		1		1	3	0.6	0.5
Pycnopsyche	14	33	9	12	3	71	14.2	11.3
Triaenodes			2	3		5	1.0	1.3
LEPIDOPTERA			15			15	3.0	6.7
Eoparargyractis			15			15	3.0	6.7
COLEOPTERA	6	1	12			19	3.8	5.2
Hydroporus	5					5	1.0	2.2
Macronychus		1				1	0.2	0.4
Stenelmis	1		12			13	2.6	5.3

CLEAR LAKE NOV 8 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
	sub	sub	sub		sub			
DIPTERA	518.3	200.8	408.2	45	283	1455.3	291.1	183.1
DIPTERA: Ceratopogonidae	37	8	31	9	9	94	18.8	14.0
Bezzia	23	4	28	9	9	73	14.6	9.2
Probezzia	14	4	3			21	4.2	5.8
DIPTERA: Chironomidae	479.3	192.8	376.2	36	274	1358.3	271.7	170.1
Subfam.-Tanypodinae	28.8	28.9	116.5	4	2.7	180.9	36.2	46.7
Ablabesmyia	24	5.8	15		2.7	47.5	9.5	8.8
Conchapelopia	4.8	8	8	1		21	4.2	3.6
Procladius		14	90	3		106.7	21.3	38.9
Thienemannimyia		2	4			5.7	1.1	1.7
Subfam.-Prodiamesinae		5.8				5.8	1.2	2.6
Monodiamesa		6				5.8	1.2	2.6
Subfam.-Orthocladiinae	134.2		7.6	1		142.8	28.6	59.1
Heterotrissocladius	71.9					71.9	14.4	28.8
Limnophyes	4.8					4.8	1.0	2.1
Parakiefferiella	9.6					9.6	1.9	4.3
Psectrocladius	28.7		4	1		33.5	6.7	12.4
Rheocricotopus	14.4					14.4	2.9	6.4
Zalutschia	4.8		4			8.6	1.7	2.1
Subfam.-Chironominae	316.3	158.1	252.1	31	271.3	1028.8	205.8	113.4
Tribe-Chironomini	287.5	156.2	252.1	29	98.6	823.4	164.7	106.7
Chironomus			4		6	9.3	1.9	2.6
Cryptochironomus			8			7.5	1.5	3.4
Dicrotendipes	4.8	3.8	48.9	3	8.2	68.7	13.7	17.7
Glyptotendipes		4		2		5.9	1.2	1.7
Microtendipes	4.8	54	64	5	47	174.3	34.9	28.0
Nilothauma		2	4	1		6.7	1.3	1.6
Pagastiella					3	2.7	0.5	1.2
Polypedilum	4.8	6		1	3	14.8	3.0	2.2
Pseudochironomus	4.8	56	12	9	15	96.8	19.4	18.6
Stenochironomus		2	4	1	6	12.2	2.4	2.2
Stictochironomus	258.7	27	23	3		311.3	62.3	110.4
Tribelos	9.6	2	87	4	14	115.7	23.1	35.7
Tribe-Tanytarsini	28.8	1.9		2	172.7	205.4	41.1	74.5
Cladotanytarsus	4.8	2		2	3	11.4	2.3	1.7
Paratanytarsus	14.4					14.4	2.9	6.4
Tanytarsus/Micropsectra	9.6				170	179.6	35.9	67.1
DIPTERA: Tipulidae	1					1	0.2	0.4
Pedicia	1					1	0.2	0.4
DIPTERA: Misc.	1		1			2	0.4	0.5
Dolichopodidae	1					1	0.2	0.4
Empididae: Hemerodromia			1			1	0.2	0.4
GASTROPODA		1	1	10		12	2.4	4.3
Fernissia		1		4		5	1.0	1.7
Menetus			1	6		7	1.4	2.6
BIVALVIA	22		4	4	3	33	6.6	8.8
Pisidium	22		4	4	3	33	6.6	7.8

CROSSON LAKE OCT 26 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
	sub	sub	sub	sub	sub			
TURBELLARIA	2		1	1		4	0.8	0.8
Dugesia	2		1	1		4	0.8	0.8
NEMATODA	2	5	4	4		15	3.0	2.0
Anatonchus	1			1		2	0.4	0.5
Dorylaimus			1			1	0.2	0.4
Mermithidae	1	5	3	3		12	2.4	1.9
OLIGOCHAETA	17	10	15	5	2	49	9.8	6.4
Aulodrilus		2	4			6	1.2	1.8
Enchytraeidae	9	2	2	2	1	16	3.2	3.3
Ilyodrilus	7	3	3			13	2.6	2.9
Lumbriculus		1				1	0.2	0.4
Nais			3		1	4	0.8	1.3
Slavania		1	1			2	0.4	0.5
Tubificidae + hairs		1	1	2		4	0.8	0.8
Uncinais			1	1		2	0.4	0.5
Vejdovskyella	1					1	0.2	0.4
HIRUDINEA	1			1		2	0.4	0.5
Gloiobdella				1		1	0.2	0.4
Helobdella	1					1	0.2	0.4
AMPHIPODA	153	140	245	150	126	814	162.8	47.1
Crangonyx	3			1	1	5	1.0	1.2
Hyalella	150	140	245	149	125	809	161.8	47.6
HYDRACARINA		12	3	4	6	25	5.0	4.5
Hydrodroma					1	1	0.2	0.4
Hygrobates				1		1	0.2	0.4
Limnochares					5	5	1.0	2.2
Pseudohydryphantes		11	1	2		14	2.8	4.7
Unionicola		1	2	1		4	0.8	0.8
COLLEMBOLA			2	1		3	0.6	0.9
Hypogastrura			2	1		3	0.6	0.9
EPHEMEROPTERA	223	251	120	87	81	762	152.4	79.3
Caenis	92	190	67	27	34	410	82.0	65.8
Eurylophella	32	10	11	5	15	73	14.6	10.4
Hexagenia	1		1			2	0.4	0.5
Leptophlebia	95	49	40	53	32	269	53.8	24.4
Stenacron	1	1		1		3	0.6	0.5
Stenonema	2	1	1	1		5	1.0	0.7
ODONATA	17	22	30	19	60	148	29.6	17.7
Basiaeschna			1			1	0.2	0.4
Celithemis					49	49	9.8	21.9
Enallagma	6	7	1	5	3	22	4.4	2.2
Tetragoneuria	2	3	3	3		11	2.2	1.3
Hagenius		1				1	0.2	0.4
Gomphus	7	3	17	10	4	41	8.2	5.6
Ischnura	2	2	7		3	14	2.8	2.6
Libellula		6	1	1	1	9	1.8	2.1
HEMIPTERA					1	1	0.2	0.4
Lethocerus					1	1	0.2	0.4
MEGALOPTERA		5		1		6	1.2	2.2
Sialis		5		1		6	1.2	2.2
TRICHOPTERA	18	22	29	29	5	103	20.6	9.9
Agarodes	2	4		4		10	2.0	2.0
Agypnia	1		1			2	0.4	0.5
Hydroptila			1	1		2	0.4	0.5
Lepidostoma					1	1	0.2	0.4
Lype			1			1	0.2	0.4
Molanna			2			2	0.4	0.9
Mystacides		1				1	0.2	0.4
Nectopsyche	8	7	5	14		34	6.8	4.5
Nyctiophylax			4			4	0.8	1.8
Oecetis	2	4	4	4	4	18	3.6	0.8
Oxyethira	3		3	1		7	1.4	1.5
Polycentropus	1	5	4			10	2.0	2.3
Pycnopsyche	1	1	3	4		9	1.8	1.6
Triaenodes			1	1		2	0.4	0.5
COLEOPTERA	80	123	6	99	20	328	65.6	50.6
Donacia		1	1			2	0.4	0.5
Dubiraphia	76	120	1	92	2	291	58.2	54.1
Macronychus	2	1	3	6		12	2.4	2.3
Phytosus			1			1	0.2	0.4
Stenelmis	2	1		1	18	22	4.4	8.1

CROSSON LAKE OCT 26 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
	sub	sub	sub	sub	sub			
DIPTERA	595	563	706	365	856	3084	616.8	181.5
DIPTERA:Ceratopogonidae	9	12	18	5	16	60	12.0	5.2
Bezzia	6	3	8		16	33	6.6	5.4
Palpomyia			4			4	0.8	1.8
Probezzia	3	9	6	5		23	4.6	3.0
DIPTERA:Chironomidae	586	551	686	360	840	3022	604.4	176.7
Subfam.-Tanypodinae	135	198	175	137	336	981	196.2	82.6
Ablabesmyia	29	39	56	72	67	263	52.6	16.4
Conchapelopia	6	17	7	11		40	8.0	6.1
Djalmabatista	53	11			25	89	17.8	22.1
Labrundinia	6			4		10	1.9	2.7
Larsia	6	11		29		46	9.1	11.9
Procladius	35	121	112	22	235	525	105.0	85.3
Zavrelimyia					8	8	1.7	3.8
Subfam.-Orthocladiinae	158	88	175	61	126	608	121.6	47.4
Heterotanytarsus			14			14	2.8	6.3
Heterotrissocladius	18					18	3.5	7.9
Parakiefferiella	18	6	28	18	17	87	17.4	7.0
Psectrocladius	47	72	91	26	59	295	59.0	22.0
Zalutschia	76	11	42	18	50	197	39.4	23.3
Subfam.-Chironominae	293	264	336	162	378	1433	286.6	81.9
Tribe-Chironomini	111	88	147	126	193	666	133.1	39.9
Chironomus	12		14	4		29	5.9	6.6
Dicrotendipes	41	40	28	18	126	253	50.6	38.6
Endochironomus	6	11		25	8	51	10.1	9.4
Lauterborniella			7			7	1.4	3.1
Microtendipes	6	22	7	18	25	78	15.6	8.8
Nilothauma				4		4	0.7	1.6
Pagastiella			7			7	1.4	3.1
Paratendipes				4		4	0.7	1.6
Polypedilum			56		17	73	14.6	21.7
Pseudochironomus	6	12	14	4	17	53	10.6	4.9
Stenochironomus			7			7	1.4	3.1
Tribelos	41	6	7	47		100	20.1	22.0
Zavreliella				4		4	0.7	1.6
Tribe-Tanytarsini	181	176	189	36	185	767	153.5	65.8
Cladotanytarsus	47	127	21		92	287	57.4	51.9
Paratanytarsus	41	17	7	4	42	110	22.0	18.4
Stempellina		6				6	1.1	2.5
Stempellinella		6				6	1.1	2.5
Tanytarsus/Micropsectra	94	22	161	32	51	360	71.9	50.8
DIPTERA:Tabanidae			1			1	0.2	0.4
Chrysops			1			1	0.2	0.4
DIPTERA:Tipulidae			1			1	0.2	0.4
Erioptera			1			1	0.2	0.4
GASTROPODA	33	16	1	4	11	65	13.0	12.6
Amnicola	2	6		1	11	20	4.0	4.5
Ferrissia		3	1	1		5	1.0	1.2
Menetus	31	7		2		40	8.0	13.2
BIVALVIA	2	1	3	2	6	14	2.8	1.9
Pisidium	2	1	3	2	6	14	2.8	1.7

CRADLE LAKE NOV 7 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
NEMATODA					2	2	0.4	0.9
Anatonchus					2	2	0.4	0.9
OLIGOCHAETA	1	1			5	7	1.4	2.1
Enchytraeidae					3	3	0.6	1.3
Lumbriculus	1	1			2	4	0.8	0.8
HIRUDINEA			2	3	2	7	1.4	1.3
Gloiobdella				2		2	0.4	0.9
Nephelopsis			2	1	2	5	1.0	1.0
AMPHIPODA	76	15	34	18	81	224	44.8	31.6
Crangonyx		13	4	3	1	21	4.2	5.2
Hyalella	76	2	30	15	80	203	40.6	35.6
EPHEMEROPTERA	2	2	1	5	159	169	33.8	70.0
Caenis					29	29	5.8	13.0
Eurylophella	1			1	27	29	5.8	11.9
Leptophlebia	1	2	1	4	101	109	21.8	44.3
Stenonema					2	2	0.4	0.9
ODONATA	1	8	4		46	59	11.8	19.4
Aeshna		1			1	2	0.4	0.5
Cordulia		4			1	5	1.0	1.7
Enallagma					36	36	7.2	16.1
Gomphus			2			2	0.4	0.9
Leucorrhinia					7	7	1.4	3.1
Libellula	1	3	2			6	1.2	1.3
Somatochlora					1	1	0.2	0.4
HEMIPTERA	2	7	4	2	3	18	3.6	2.1
Buenoa		1				1	0.2	0.4
Cenocorixa		1			1	2	0.4	0.5
Notonecta				1		1	0.2	0.4
Sigara	2	5	4	1	2	14	2.8	1.5
MEGALOPTERA					1	1	0.2	0.4
Sialis					1	1	0.2	0.4
TRICHOPTERA	6	18	2	12	9	47	9.4	6.1
Agypnia		1				1	0.2	0.4
Banksiola		1				1	0.2	0.4
Molanna	1			1	1	3	0.6	0.5
Oecetis	4	8		5		17	3.4	3.4
Oxyethira		2	1	2	5	10	2.0	1.9
Ptilostomis		1			2	3	0.6	0.9
Pycnopsyche		5	1	4	1	11	2.2	2.2
Triaenodes	1					1	0.2	0.4
COLEOPTERA		1		1	7	9	1.8	2.9
Graphoderus				1		1	0.2	0.4
Gyrinus		1				1	0.2	0.4
Hydroporus					7	7	1.4	3.1
DIPTERA	42	96	65	108	371	682	136.0	133.8
DIPTERA:Ceratopogonidae	4	9	2	3	21	39	7.8	7.9
Bezzia	3	8	1	3	20	35	7.0	6.9
Monohelea		1				1	0.2	0.4
Palpomyia			1			1	0.2	0.4
Probezzia	1				1	2	0.4	0.5
DIPTERA:Chironomidae	38	86	63	105	350	642	128.4	126.4
Subfam.-Tanypodinae	4	27	6	21	16	74	14.8	9.8
Ablabesmyia	1	1			1	3	0.6	0.5
Clinotanypus			1	19	2	22	4.4	8.2
Procladius	3	26	5	2	12	48	9.6	10.0
Zavrelimyia					1	1	0.2	0.4
Subfam.-Orthocladiinae	4	6	3		97	110	22.0	42.0
Heterotrissocladius					46	46	9.2	18.4
Psectrocladius	4	6	3		50	63	12.6	18.8
Stackelbergina					1	1	0.2	0.4
Subfam.-Chironominae	30	53	54	84	237	458	91.6	83.5
Tribe-Chironomini	23	47	48	81	147	346	69.2	48.1
Chironomus		2				2	0.4	0.9
Cryptochironomus	1	1			5	7	1.4	2.1
Dicrotendipes	3	6	3	7	32	51	10.2	11.0
Glyptotendipes			1			1	0.2	0.4
Microtendipes	2	19	6	13	61	101	20.2	23.7
Nilothauma			3	1		4	0.8	1.2
Paratendipes					16	16	3.2	7.2
Polypedilum	1			2		3	0.6	0.9
Pseudochironomus			1	2	33	36	7.2	12.9
Stenochironomus			1	1		2	0.4	0.5
Tribelos	16	19	33	55		123	24.6	20.6
Tribe-Tanytarsini	7	6	6	3	90	112	22.4	37.8
Cladotanytarsus		1			23	24	4.8	10.2
Paratanytarsus			1			1	0.2	0.4
Tanytarsus/Micropsectra	7	5	5	3	67	87	17.4	27.8
DIPTERA:Chaoboridae		1				1	0.2	0.4
Chaoborus		1				1	0.2	0.4
BIVALVIA		1	1	5	5	12	2.4	2.4
Pisidium		1	1	5	5	12	2.4	2.4

DELANO LAKE NOV 8 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
			sub	sub				
NEMATODA		1	2			3	0.6	0.9
Mermithidae		1	2			3	0.6	0.9
OLIGOCHAETA		16	31			47	9.4	13.9
Enchytraeidae		15				15	3.0	6.7
Lumbriculus		1	1			2	0.4	0.5
Tubificidae - hairs			30			30	6.0	13.4
HIRUDINEA	1		17			18	3.6	7.5
Desserobdella			1			1	0.2	0.4
Erpobdella	1					1	0.2	0.4
Helobdella			16			16	3.2	7.2
AMPHIPODA	311	196	18	29	151	705	141.0	122.2
Crangonyx	2	33	7	8	3	53	10.6	12.8
Hyalella	309	163	11	21	148	652	130.4	122.0
HYDRACARINA			3		1	4	0.8	1.3
Hydrodroma					1	1	0.2	0.4
Limnesia			2			2	0.4	0.9
Unionicola			1			1	0.2	0.4
EPHEMEROPTERA	159	142	131	302	124	858	171.6	74.1
Caenis	78	14	61	90	6	249	49.8	37.9
Eurylophella	7	23	3	52	36	121	24.2	20.4
Leptophlebia	64	100	65	160	67	456	91.2	41.3
Stenacron	1	3			7	11	2.2	2.9
Stenonema	9	2	2		8	21	4.2	4.0
ODONATA	27	33	13	36	20	129	25.8	9.4
Aeshna				1		1	0.2	0.4
Chromagrion				1		1	0.2	0.4
Cordulia	5	3	2	7	3	20	4.0	2.0
Enallagma	6	7	9	2	1	25	5.0	3.0
Tetragonuria		5	1	2		8	1.6	2.1
Hagenius		1		1	1	3	0.6	0.5
Gomphus	10	11		17	4	42	8.4	6.6
Ischnura	5	2		5		12	2.4	2.5
Libellula	1		1			2	0.4	0.5
Somatochlora		4			11	15	3.0	4.8
HEMIPTERA			1	2		3	0.6	0.9
Lethocerus				2		2	0.4	0.9
Sigara			1			1	0.2	0.4
TRICHOPTERA	14	22	62	29	5	132	26.4	21.8
Agarodes	2					2	0.4	0.9
Agrypnia	1		3			4	0.8	1.2
Banksiola				1		1	0.2	0.4
Hydroptila			15	6		21	4.2	6.6
Nectopsyche	1		1	2		4	0.8	0.8
Nyctiophylax				1		1	0.2	0.4
Oecetis	4		1	4	1	10	2.0	1.7
Oxyethira	1		41	1		43	8.6	16.2
Platycentropus sp.				1		1	0.2	0.4
Polycentropus	1	2	1	5	1	10	2.0	1.5
Pycnopsyche	4	19		7	3	33	6.6	7.4
Triaenodes		1		1		2	0.4	0.5
COLEOPTERA	34	17	3	118	3	175	35.0	48.1
Agabus			1			1	0.2	0.4
Dineutus		1				1	0.2	0.4
Dubiraphia	32	14	1	108		155	31.0	44.9
Haliplus				3		3	0.6	1.3
Hydroporus			1			1	0.2	0.4
Macronychus		1		5	3	9	1.8	2.2
Scirtes				2		2	0.4	0.9
Stenelmis	2	1				3	0.6	0.9

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TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
			sub	sub				
DIPTERA	298	157	1203	688	104	2450	489.9	459.2
DIPTERA:Ceratopogonidae	11		107	21	2	141	28.2	44.8
Bezzia	11		100	21	2	134	26.8	37.3
Dasyhelea			2			2	0.4	0.9
Palpomyia			5			5	1.0	2.2
DIPTERA:Chironomidae	286	157	1092	667	102	2304	460.7	415.9
Subfam.-Tanypodinae	114	43	303	166	22	647	129.4	112.4
Ablabesmyia	25	1	22	25	7	80	16.0	10.0
Clinotanypus	3	1				4	0.8	1.3
Conchapelopia	18	26		19	8	71	14.2	10.2
Guttipelopia			22			22	4.3	9.7
Labrundinia			22			22	4.3	9.7
Larsia	7	1	22	6		36	7.2	8.6
Procladius	59	11	216	90	3	379	75.9	86.2
Zavrelimyia	2	3		25	4	34	6.8	10.3
Subfam.-Orthocladiinae	13	19	65	19	3	119	23.7	23.9
Heterotanytarsus		1				1	0.2	0.4
Heterotrissocladius	1	15				16	3.2	5.9
Nanocladius	1				1	2	0.4	0.5
Parakiefferiella	1				1	2	0.4	0.5
Parametriocnemus					1	1	0.2	0.4
Psectrocladius	8		65	13		86	17.2	24.4
Xylotopus				6		6	1.3	2.8
Zalutschia	2	3				5	1.0	1.3
Subfam.-Chironominae	159	95	724	483	77	1538	307.6	284.9
Tribe-Chironomini	114	52	573	295	30	1064	212.7	226.6
Chironomus			151	75	3	230	45.9	67.1
Cladopelma	1					1	0.2	0.4
Cryptochironomus				31		31	6.3	14.0
Dicrotendipes	16	14	346	19		395	79.0	133.7
Endochironomus	2					2	0.4	0.9
Glyptotendipes		1			2	3	0.6	0.9
Microtendipes	5	17	32	88	1	143	28.6	35.3
Nilothauma	2	1				3	0.6	0.9
Omisus			22		1	23	4.5	9.6
Pagastiella	29	5				34	6.8	12.6
Paratendipes	6					6	1.2	2.4
Polypedilum	6	8			1	15	3.0	3.3
Pseudochironomus	7	1				8	1.6	2.7
Stenochironomus					2	2	0.4	0.9
Tribelos	33			56	8	97	19.5	24.7
Xenochironomus	1					1	0.2	0.4
Zavreliella	6	5	22	25	12	70	13.9	9.1
Tribe-Tanytarsini	45	43	151	188	47	474	94.9	69.5
Cladotanytarsus	13	1			2	16	3.2	5.5
Paratanytarsus	8	2	43	6		60	11.9	17.8
Tanytarsus/Micropsectra	24	40	108	182	45	399	79.8	65.4
DIPTERA:Tabanidae	1		1			2	0.4	0.5
Chrysops	1		1			2	0.4	0.5
DIPTERA:Tipulidae			3			3	0.6	1.3
Erioptera			3			3	0.6	1.3
GASTROPODA	22	18	96	28	20	184	36.8	33.3
Amnicola	8		80	15		103	20.6	33.8
Helisoma			1			1	0.2	0.4
Menetus	14	18	15	13	20	80	16.0	2.9
BIVALVIA	11	10	12	16		49	9.8	5.9
Musculium			1			1	0.2	0.4
Pisidium	11	10	11	16		48	9.6	5.2

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TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
COELENTERATA				1		1	0.2	0.4
Hydra				1		1	0.2	0.4
TURBELLARIA		3	1	11	1	16	3.2	4.5
Dugesia		3	1	11	1	16	3.2	4.5
NEMATODA	8	4			1	13	2.6	3.4
Anatonchus	5	3				8	1.6	2.3
Dorylaimus	2					2	0.4	0.9
Mermithidae	1	1			1	3	0.6	0.5
OLIGOCHAETA	8	9	12	6	7	42	8.4	2.3
Arteonais					1	1	0.2	0.4
Enchytraeidae	6	7	2	1		16	3.2	3.1
Ilyodrilus				2		2	0.4	0.9
Lumbriculus			9	1	1	11	2.2	3.8
Slavania					1	1	0.2	0.4
Tasserkidrilus			1			1	0.2	0.4
Tubificidae + hairs	2	2		2	4	10	2.0	1.4
HIRUDINEA	1					1	0.2	0.4
Nephelopsis	1					1	0.2	0.4
AMPHIPODA	378	180	105	52	102	817	163.4	128.4
Crangonyx.	4					4	0.8	1.8
Hyalella	374	180	105	52	102	813	162.6	126.7
HYDRACARINA	1	3	1		5	10	2.0	2.0
Arrenurus		1				1	0.2	0.4
Hydrodroma		1				1	0.2	0.4
Hygrobates			1			1	0.2	0.4
Limnesia	1					1	0.2	0.4
Unionicola		1			5	6	1.2	2.2
EPHEMEROPTERA	37	3	6	32	69	147	29.4	26.8
Caenis	14	1		4	20	39	7.8	8.8
Eurylophella	5			10	17	32	6.4	7.2
Hexagenia					1	1	0.2	0.4
Leptophlebia	18	2	5	16	31	72	14.4	11.5
Stenonema			1	2		3	0.6	0.9
ODONATA	45	21	34	4	18	122	24.4	15.7
Basiaeschna	1					1	0.2	0.4
Cordulia	1					1	0.2	0.4
Enallagma	19	11	25	1	15	71	14.2	8.1
Tetragonuria	3		1			4	0.8	1.3
Hagenius			2			2	0.4	0.9
Gomphus	15	10	5	3	3	36	7.2	5.2
Ischnura	6					6	1.2	2.7
Macromia			1			1	0.2	0.4
TRICHOPTERA	23	9	7	8	10	57	11.4	6.6
Agarodes	2	1		1	3	7	1.4	1.1
Agrypnia	1					1	0.2	0.4
Diplectrona		1				1	0.2	0.4
Lepidostoma				2		2	0.4	0.9
Molanna				2	1	3	0.6	0.9
Mystacides		5	1	2	3	11	2.2	1.9
Nectopsyche	7				1	8	1.6	2.7
Oecetis	8	1			1	10	2.0	3.0
Oxyethira		1	5			6	1.2	1.9
Polycentropus	1				1	2	0.4	0.5
Ptilostomis	1					1	0.2	0.4
Pycnopsyche				1		1	0.2	0.4
Triaenodes	3		1			4	0.8	1.3
LEPIDOPTERA	2					2	0.4	0.9
Eoparargyractus	2					2	0.4	0.9
COLEOPTERA	13	49	2	4	17	85	17.0	18.9
Dubiraphia	12	48	2	4	17	83	16.6	18.6
Macronychus		1				1	0.2	0.4
Stenelmis	1					1	0.2	0.4

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TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
DIPTERA	421	114	108	163	374	1180	236.0	149.9
DIPTERA: Ceratopogonidae	28	9	18	23	29	107	21.4	8.2
Alluaudomyia				1		1	0.2	0.4
Bezzia	7	2	1	2	3	15	3.0	2.1
Palpomyia		1				1	0.2	0.4
Probezzia	21	6	16	20	25	88	17.6	6.5
Stilobezzia			1		1	2	0.4	0.5
DIPTERA: Chironomidae	391	105	90	140	345	1071	214.2	142.5
Subfam.-Tanypodinae	42	28	28	45	87	230	46.0	24.2
Ablabesmyia	3	1	2	1	6	13	2.6	1.9
Clinotanypus	2					2	0.4	0.9
Conchapelopia	3	2	9	5	4	23	4.6	2.7
Djalmabatista		1		5	9	15	3.0	3.9
Larsia	26	7	9	15	37	94	18.8	12.6
Procladius	8	17	8	19	28	80	16.0	8.4
Thienemannimyia					3	3	0.6	1.3
Subfam.-Prodiamesinae	1	3	5	12	8	29	5.8	4.3
Monodiamesa	1	3	5	12	8	29	5.8	4.3
Subfam.-Orthocladiinae	61	9	5	4	50	129	25.8	27.5
Epoicocladius			1			1	0.2	0.4
Heterotrissocladius	3			1	4	8	1.6	1.6
Parakiefferiella	3	3	1	1	6	14	2.8	1.8
Psectrocladius	10	1	1	1	8	21	4.2	4.0
Pseudosmittia			1			1	0.2	0.4
Synorthocladius				1		1	0.2	0.4
Zalutschia	45	5	1		32	83	16.6	20.6
Subfam.-Chironominae	287	65	52	79	200	683	136.6	102.8
Tribe-Chironomini	201	50	9	48	133	441	88.2	77.6
Cladopelma					1	1	0.2	0.4
Cryptochironomus	4	6		1	5	16	3.2	2.6
Dicrotendipes	23	18			21	62	12.4	10.2
Endochironomus	1			5		6	1.2	2.2
Glyptotendipes	3					3	0.6	1.2
Lauterborniella	1			1	2	4	0.8	0.8
Microtendipes	3	3			2	8	1.6	1.5
Nilothauma	3				1	4	0.8	1.2
Pagastiella	25	1		3	78	107	21.4	33.3
Parachironomus					1	1	0.2	0.4
Paralauterborniella				6		6	1.2	2.7
Phaenopsectra	1					1	0.2	0.4
Polypedilum	42	14	5	22	15	98	19.6	12.4
Pseudochironomus	92	2	2	8	5	109	21.8	35.2
Stictochironomus		6	1	2	1	10	2.0	2.3
Tribelos					1	1	0.2	0.4
Xenochironomus	2		1			3	0.6	0.9
Zavreliella	1					1	0.2	0.4
Tribe-Tanytarsini	86	15	43	31	67	242	48.4	28.3
Cladotanytarsus	32	10	43	17	60	162	32.4	20.1
Paratanytarsus	15			1		16	3.2	6.6
Stempellina		3				3	0.6	1.3
Stempellinella	1					1	0.2	0.4
Tanytarsus/Micropsectra	38	2		13	7	60	12.0	15.4
DIPTERA: Tabanidae	2					2	0.4	0.9
Chrysops	2					2	0.4	0.8
GASTROPODA	137	36	1	20	37	231	46.2	52.8
Amnicola	136	33	1	20	34	224	44.8	52.7
Ferrissia	1				3	4	0.8	1.3
Menetus		3				3	0.6	1.3
BIVALVIA	15	11	24	19	28	97	19.4	6.1
Pisidium	15	11	24	19	28	97	19.4	6.1

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TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
NEMATODA		1				1	0.2	0.4
Mermithidae		1				1	0.2	0.4
OLIGOCHAETA	3	4	3		3	13	2.6	1.5
Enchytraeidae	1	3				4	0.8	1.3
Tubificidae + hairs		1	1			2	0.4	0.5
Tubificidae - hairs	2		2		3	7	1.4	1.3
HIRUDINEA					1	1	0.2	0.4
Desserobdella					1	1	0.2	0.4
AMPHIPODA	234	388	94	679	136	1531	306.2	237.1
Crangonyx	9	2	27	9	6	53	10.6	9.6
Diporeia			67			67	13.4	30.0
Hyalella	225	386		670	130	1411	282.2	258.5
HYDRACARINA	2	3	1	6	4	16	3.2	1.9
Arrenurus				1		1	0.2	0.4
Limnesia		1				1	0.2	0.4
Limnochares	2		1	1	1	5	1.0	0.7
Pseudohydryphantes		1		4		5	1.0	1.7
Unionicola		1			3	4	0.8	1.3
EPHEMEROPTERA	116	229	872	264	71	1552	310.4	323.7
Caenis	63	60	65	29	49	266	53.2	14.9
Eurylophella	2	7	186	5	3	203	40.6	81.3
Leptophlebia	51	160	621	230	19	1081	216.2	241.5
Stenacron		2				2	0.4	0.9
ODONATA	70	70	101	116	32	389	77.8	32.5
Aeshna				1	1	2	0.4	0.5
Argia	1	2	2			5	1.0	1.0
Basiaeschna			1	1		2	0.4	0.5
Celithemis			28	5	2	35	7.0	11.9
Cordulia	6	6	6	27	2	47	9.4	10.0
Enallagma	22	21	22	21	7	93	18.6	5.8
Tetragonuria	2	3	2		3	10	2.0	1.2
Hagenius		1	3			4	0.8	1.3
Gomphus	7	8	10	8	1	34	6.8	3.4
Ischnura	8	7	10	21	4	50	10.0	6.5
Lestes	1	3	3			7	1.4	1.5
Leucorrhinia	4	5		8	1	18	3.6	3.2
Libellula	18	13	14	24	11	80	16.0	4.6
Nasiaeschna	1	1				2	0.4	0.5
HEMIPTERA		1		21		22	4.4	9.3
Hesperocorixa		1		15		16	3.2	6.6
Notonecta				6		6	1.2	2.7
MEGALOPTERA	4	11				15	3.0	4.8
Sialis	4	11				15	3.0	4.8
NEUROPTERA		1				1	0.2	0.4
Climacia		1				1	0.2	0.4
TRICHOPTERA	65	66	141	55	93	420	84.0	34.8
Agrypnia	2		1	8	4	15	3.0	2.8
Banksiola	1			1	1	3	0.6	0.5
Hydroptila	31	27	27	19	37	141	28.2	6.6
Nectopsyche	1		2	7	19	29	5.8	7.9
Nemotaulius	1		1		1	3	0.6	0.5
Nyctiophylax			1			1	0.2	0.4
Oecetis	1		2			3	0.6	0.8
Oxyethira	11	27	30	6	24	98	19.6	9.4
Phryganea sp.		1				1	0.2	0.4
Polycentropus	15	8	52	10	5	90	18.0	17.3
Ptilostomis	2	2	1	2	1	8	1.6	0.5
Pycnopsyche		1	24	2	1	28	5.6	10.3
LEPIDOPTERA		1				1	0.2	0.4
Paraponyx		1				1	0.2	0.4
COLEOPTERA	1	5		9	2	17	3.4	3.6
Dineutus				5		5	1.0	2.2
Donacia	1	5		2	2	10	2.0	1.9
Haliplus				2		2	0.4	0.9

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TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
DIPTERA	479	485	294	285	605	2148	429.6	137.4
DIPTERA: Ceratopogonidae	154	156	27	73	62	472	94.4	57.9
Bezzia	136	142	25	71	59	433	86.6	45.4
Dasyhelea	14	14				28	5.6	7.7
Monohelea	2			1	1	4	0.8	0.8
Palpomyia	1				1	2	0.4	0.5
Probezzia	1		2	1	1	5	1.0	0.6
DIPTERA: Chironomidae	323	329	267	212	543	1674	334.8	125.7
Subfam.-Tanypodinae	117	123	43	133	96	512	102.4	35.9
Ablabesmyia	24	36	10	35	19	124	24.8	9.8
Clinotanypus	16	10		6	2	34	6.8	6.4
Conchapelopia	5	6	13	11	5	40	8.0	3.7
Guttipelopia		1			1	2	0.4	0.5
Larsia	1	5	4	3	4	17	3.4	1.5
Procladius	71	65	16	78	65	295	59.0	24.6
Subfam.-Diamesinae	1		2		2	5	1.0	1.0
Potthastia	1		2		2	5	1.0	1.0
Subfam.-Orthocladiinae	6	9	48	30	83	176	35.2	31.7
Cricotopus			1			1	0.2	0.4
Paracladius	1					1	0.2	0.4
Psectrocladius	5	8	13	26	83	135	27.0	28.9
Stackelbergina			34	4		38	7.6	14.9
Zalutschia		1				1	0.2	0.4
Subfam.-Chironominae	200	197	176	49	364	986	197.2	112.1
Tribe-Chironomini	191	177	175	44	332	919	183.8	102.1
Chironomus		1	2		8	11	2.2	3.3
Cladopelma		2		1	1	4	0.8	0.8
Cryptochironomus	5	4			2	11	2.2	2.0
Dicrotendipes	19	7	4	10	8	48	9.6	5.1
Endochironomus	1			2	6	9	1.8	2.5
Glyptotendipes	2		18		2	22	4.4	6.9
Lauterborniella		10			4	14	2.8	4.4
Microtendipes	7	6	2	5	57	77	15.4	23.3
Pagastiella	12	27		3	36	78	15.6	15.5
Phaenopsectra			2			2	0.4	0.9
Polypedilum	28	39	4	11	65	147	29.4	21.7
Pseudochironomus	43	27	119	1	28	218	43.6	40.0
Stenochironomus	1	3	6			10	2.0	2.5
Stictochironomus				3		3	0.6	1.3
Tribelos	58	34	5	2	8	107	21.4	24.1
Xenochironomus		1	1			2	0.4	0.5
Zavreliella	15	16	12	6	107	156	31.2	42.6
Tribe-Tanytarsini	9	20	1	5	32	67	13.4	12.6
Cladotanytarsus	6	15		1	22	44	8.8	9.5
Paratanytarsus	1	1		1	2	5	1.0	0.7
Tanytarsus/Micropsectra	2	4	1	3	8	18	3.6	2.7
DIPTERA: Tabanidae	2					2	0.4	0.9
Chrysops	2					2	0.4	0.8
GASTROPODA	3	4		1		8	1.6	1.8
Ferrissia	1	3		1		5	1.0	1.2
Menetus	2	1				3	0.6	0.9
BIVALVIA	19	1	18	11	33	82	16.4	11.7
Pisidium	19	1	18	11	33	82	16.4	10.5

HENEY LAKE OCT 26 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
	sub		sub	sub	sub			
TURBELLARIA		1			1	2	0.4	0.5
Dugesia		1			1	2	0.4	0.5
NEMATODA	2		1			3	0.6	0.9
Anatonchus	1					1	0.2	0.4
Mermithidae	1		1			2	0.4	0.5
OLIGOCHAETA	5	1	6	6	4	22	4.4	2.1
Aulodrilus				1	2	3	0.6	0.9
Enchytraeidae				2		2	0.4	0.9
Lumbriculus			3			3	0.6	1.3
Lumbriculidae	1			1		2	0.4	0.5
Nais	4		1		1	6	1.2	1.5
Stylaria				1		1	0.2	0.4
Tubificidae + hairs		1	1		1	3	0.6	0.5
Tubificidae - hairs			1	1		2	0.4	0.5
HIRUDINEA	2	1			4	7	1.4	1.7
Erpobdella					1	1	0.2	0.4
Helobdella	2	1			2	5	1.0	1.0
Batracobdella					1	1	0.2	0.4
AMPHIPODA	60	22	83	100	22	287	57.4	35.3
Crangonyx	9		6	1	2	18	3.6	3.8
Hyalella	51	22	77	99	20	269	53.8	34.4
HYDRACARINA	7				3	10	2.0	3.1
Arrenurus	1					1	0.2	0.4
Limnochares	5					5	1.0	2.2
Pseudohydryphantes	1					1	0.2	0.4
Unionicola					3	3	0.6	1.3
EPHEMEROPTERA	60	24	35	72	118	309	61.8	36.8
Caenis	45	10	10	26	66	157	31.4	24.1
Eurylophella	6	3	2	4	8	23	4.6	2.4
Leptophlebia	9	11	23	42	43	128	25.6	16.3
Stenonema					1	1	0.2	0.4
ODONATA	24	8	42	85	14	173	34.6	31.0
Basiaeschna					1	1	0.2	0.4
Celithemis	18	4	28	64		114	22.8	25.6
Cordulia	1		2	1		4	0.8	0.8
Enallagma			2	7	2	11	2.2	2.9
Tetragonuria					1	1	0.2	0.4
Gomphus	3	3	3	3	3	15	3.0	
Ischnura			4	10	7	21	4.2	4.4
Leucorrhinia	1		2			3	0.6	0.9
Libellula	1	1	1			3	0.6	0.5
TRICHOPTERA	3	3	13	2	6	27	5.4	4.5
Agypnia				1		1	0.2	0.4
Banksiola				1		1	0.2	0.4
Nectopsyche					1	1	0.2	0.4
Oecetis	2		2			4	0.8	1.1
Oxyethira	1		3		4	8	1.6	1.6
Polycentropus		1			1	2	0.4	0.5
Ptilostomis		1				1	0.2	0.4
Pycnopsyche		1	8			9	1.8	3.5
COLEOPTERA		1	1	3	32	37	7.4	13.8
Donacia					1	1	0.2	0.4
Dubiraphia		1	1	3	31	36	7.2	13.3

HENEY LAKE OCT 26 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
	sub		sub	sub	sub			
DIPTERA	1076	173	487	1589	448	3773	754.6	570.9
DIPTERA:Ceratopogonidae	19	6	16	22	12	75	15.0	6.2
Bezzia	19	6	15	22	12	74	14.8	5.6
Monohelea			1			1	0.2	0.4
DIPTERA:Chironomidae	1057	167	471	1567	436	3698	739.6	565.2
Subfam.-Tanypodinae	138	41	85	361	70	694	138.7	128.8
Ablabesmyia	11	8	33	63	26	141	28.2	19.7
Clinotanypus		1				1	0.2	0.4
Conchapelopia	11		9		4	24	4.9	5.0
Labrundinia					31	31	6.1	13.6
Larsia		4	5	16	4	29	5.8	5.4
Procladius	116	28	38	282	4	469	93.7	113.4
Subfam.-Orthocladiinae	85	26	155	439	78	783	156.6	164.3
Heterotrissocladius					4	4	0.9	2.0
Parametriocnemus			9			9	1.9	4.2
Psectrocladius	85	23	137	313	4	562	112.4	110.8
Zalutschia		3	9	125	70	207	41.4	49.1
Subfam.-Chironominae	835	100	231	768	288	2221	444.2	333.9
Tribe-Chironomini	307	62	184	596	209	1357	271.4	201.1
Chironomus		17	9		31	57	11.4	12.8
Cladopelma					4	4	0.9	2.0
Cryptochironomus		1	5	16		22	4.4	6.1
Dicrotendipes	137	8	47	439	66	697	139.4	155.5
Endochironomus		3	9	16	4	33	6.5	6.2
Glyptotendipes					48	48	9.6	21.4
Lauterborniella			5		4	9	1.8	2.5
Microtendipes	85	3	42	63		193	38.5	37.0
Pagastiella		5	5			10	1.9	2.7
Phaenopsectra		1				1	0.2	0.4
Polypedilum	11		33	16	13	73	14.6	10.7
Pseudochironomus	43	3	14	16		76	15.2	15.2
Tribelos		5			31	36	7.1	13.3
Zavreliella	32	15	14	31	9	101	20.2	10.6
Tribe-Tanytarsini	529	38	47	172	78	864	172.9	205.8
Cladotanytarsus	222	16	28	141	4	412	82.3	95.3
Paratanytarsus	21	2			13	36	7.2	9.5
Stempellina		1				1	0.2	0.4
Tanytarsus/Micropsectra	286	19	19	31	61	416	83.2	102.6
GASTROPODA		1	10	1	6	18	3.6	4.3
Amnicola		1	3	1	3	8	1.6	1.3
Ferrissia			7			7	1.4	3.1
Menetus					3	3	0.6	1.3
BIVALVIA	2	3	7	16	2	30	6.0	6.0
Musculium					1	1	0.2	0.4
Pisidium	2	3	7	16	1	29	5.8	5.5

PLASTIC LAKE OCT 24 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
TURBELLARIA	1				1	2	0.4	0.5
Dugesia	1				1	2	0.4	0.5
NEMATODA	1	1			1	3	0.6	0.5
Anatonchus	1				1	2	0.4	0.5
Mermithidae		1				1	0.2	0.4
OLIGOCHAETA	6	2	12		1	21	4.2	4.9
Enchytraeidae	5	2	3			10	2.0	2.1
Lumbriculus			8		1	9	1.8	3.5
Tubificidae + hairs	1		1			2	0.4	0.5
HIRUDINEA			1			1	0.2	0.4
Gloiobdella			1			1	0.2	0.4
AMPHIPODA	37	8	3	18	40	106	21.2	16.7
Hyalella	37	8	3	18	40	106	21.2	16.7
EPHEMEROPTERA	13	6	13	11	6	49	9.8	3.6
Eurylophella			1		1	2	0.4	0.5
Leptophlebia	13	6	12	11	5	47	9.4	3.6
ODONATA	9	6	14	8	1	38	7.6	4.7
Celithemis		2	3			5	1.0	1.4
Cordulia			2			2	0.4	0.9
Enallagma	6	1	1	2		10	2.0	2.1
Tetragonuria				1		1	0.2	0.4
Gomphus	1		2	1	1	5	1.0	0.7
Ischnura	2	3	5	4		14	2.8	1.9
Libellula			1			1	0.2	0.4
TRICHOPTERA	3		20	5	11	39	7.8	7.9
Agarodes			3	1	1	5	1.0	1.2
Agrypnia			2	1		3	0.6	0.8
Hydroptila			2		1	3	0.6	0.9
Nectopsyche	1		2		1	4	0.8	0.7
Nyctiophylax			1			1	0.2	0.4
Oecetis	2		4	1	5	12	2.4	1.9
Oxyethira			3	1	1	5	1.0	1.1
Polycentropus			1		2	3	0.6	0.9
Ptilostomis			1			1	0.2	0.4
Pycnopsyche			1	1		2	0.4	0.5
DIPTERA	240	271	711	134	188	1544	308.8	230.8
DIPTERA:Ceratopogonidae	6	10	47	5	11	79	15.8	17.6
Bezzia	4	9	44	4	6	67	13.4	15.4
Dasyhelea			1			1	0.2	0.4
Probezzia	2	1	2	1	5	11	2.2	1.5
DIPTERA:Chironomidae	234	261	664	129	177	1465	293.0	213.6
Subfam.-Tanypodinae	50	45	178	41	44	358	71.6	59.6
Ablabesmyia	24	14	91	12	22	163	32.6	29.6
Clinotanypus	2		4	1	9	16	3.2	3.6
Conchapelopia		7	7	9	4	27	5.4	3.5
Labrundinia			3			3	0.6	1.3
Larsia	2		3	1		6	1.2	1.3
Procladius	22	24	70	18	9	143	28.6	23.8
Subfam.-Orthocladiinae	52	85	166	31	19	353	70.6	58.9
Heterotrissocladius			5			5	1.0	2.2
Parakiefferiella		1	4			5	1.0	1.7
Psectrocladius	36	30	90	20	14	190	38.0	27.1
Stackelbergina	3	1	1	1		6	1.2	1.1
Zalutschia	13	53	66	10	5	147	29.4	28.0
Subfam.-Chironominae	132	131	320	57	114	754	150.8	99.4
Tribe-Chironomini	96	108	159	41	91	495	99.0	42.2
Chironomus	13	3	1	4	2	23	4.6	4.8
Cladopelma sp.	7	1	9		3	20	4.0	3.9
Cryptochironomus	1	10	13	4	8	36	7.2	4.8
Dicrotendipes	2	26	41	4		73	14.6	16.2
Glyptotendipes	4		4	6	6	20	4.0	2.4
Lauterborniella	2		10	1	1	14	2.8	4.1
Microtendipes	11	51	42	13	9	126	25.2	19.8
Nilothauma	2		2			4	0.8	1.0
Pagastiella	2					2	0.4	0.9
Paratendipes			3			3	0.6	1.3
Phaenopsectra			1			1	0.2	0.4
Polypedilum	13	5	18	4	1	41	8.2	6.3
Pseudochironomus	6	10	7	2	2	27	5.4	3.1
Stenochironomus			1			1	0.2	0.4
Tribelos	32	2	7	3	59	103	20.6	24.7
Xenochironomus	1					1	0.2	0.4
Tribe-Tanytarsini	36	23	161	16	23	259	51.8	61.5
Cladotanytarsus	14	12	83	6	9	124	24.8	32.7
Paratanytarsus	4	1	18	3	1	27	5.4	7.2
Tanytarsus/Micropsectra	18	10	60	7	13	108	21.6	21.8
GASTROPODA	2		6	1	2	11	2.2	2.3
Ferrissia	1		6	1	2	10	2.0	2.3
Menetus	1					1	0.2	0.4
BIVALVIA	54	26	85	17	10	192	38.4	31.0
Pisidium	54	26	85	17	10	192	38.4	27.7

PINCHER LAKE OCT 30 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
	sub	sub	sub	sub	sub			
OLIGOCHAETA	1	2	2	1	1	7	1.4	0.5
Enchytraeidae		1				1	0.2	0.4
Lumbriculus	1	1	2	1	1	6	1.2	0.4
HIRUDINEA	2	2	2	1	4	11	2.2	1.1
Erpobdella	2	1	2		4	9	1.8	1.5
Helobdella		1		1		2	0.4	0.5
AMPHIPODA	201	168	86	50	228	733	146.6	75.9
Crangonyx	195	140	65	49	209	658	131.6	73.0
Hyalella	6	28	21	1	19	75	15.0	11.2
EPHEMEROPTERA	59	179	259	156	277	930	186.0	87.6
Eurylophella	4	9	7	4	102	126	25.2	43.0
Leptophlebia	55	170	252	152	175	804	160.8	70.5
ODONATA	46	100	193	156	51	546	109.2	64.6
Aeshna	1		3	2		6	1.2	1.2
Chromagrion				8		8	1.6	3.6
Cordulia	2	2	3	6		13	2.6	2.2
Enallagma	22	3	20	8	1	54	10.8	9.7
Gomphus	1		4		9	14	2.8	3.8
Lestes disjunctus	1		3			4	0.8	1.3
Leucorrhinia	17	75	154	131	22	399	79.8	62.1
Libellula	2	20	6	1	19	48	9.6	9.2
HEMIPTERA	19	20	21	6	27	93	18.6	7.7
Buenoa	1				1	2	0.4	0.5
Hesperocorixa		1	5	1		7	1.4	1.9
Notonecta	14	12	9	5	22	62	12.4	5.7
Sigara	4	7	7		4	22	4.4	2.6
TRICHOPTERA	192	57	153	137	69	608	121.6	57.3
Agrypnia				2		2	0.4	0.9
Banksiola	20	15	39	19	2	95	19.0	11.9
Molanna			1			1	0.2	0.4
Mystacides					2	2	0.4	0.9
Nectopsyche	9	1	1	11	1	23	4.6	5.0
Nemotaulius	2			2	4	8	1.6	1.7
Nyctiophylax					1	1	0.2	0.4
Oecetis	7	8	3	4	8	30	6.0	2.1
Oxyethira	140	25	34	81	10	290	58.0	53.0
Platycentropus				1	11	12	2.4	4.8
Polycentropus	12	2	69	16	5	104	20.8	24.6
Ptilostomis	1	3	4			8	1.6	1.8
Pycnopsyche	1	3	2	1	25	32	6.4	10.4
LEPIDOPTERA		1				1	0.2	0.4
Eoparargyractus		1				1	0.2	0.4
COLEOPTERA	11	5	2	3	8	29	5.8	3.7
Agabus	2					2	0.4	0.9
Coptotomus	1			1		2	0.4	0.5
Dineutus	7	3	1	1	1	13	2.6	2.6
Graphoderus				1		1	0.2	0.4
Gyrinus	1	2	1			4	0.8	0.8
Hydroporus					7	7	1.4	3.1

PINCHER LAKE OCT 30 1989

	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
	sub	sub	sub	sub	sub			
DIPTERA	1381	975	1225	1279	786	5645	1129.0	243.2
DIPTERA:Ceratopogonidae	106	11	75	51	32	275	55.0	37.0
Bezzia	106	9	72	51	28	266	53.2	33.9
Probezzia		2	3		4	9	1.8	1.8
DIPTERA:Chironomidae	1274	964	1147	1227	754	5365	1073.0	214.0
Subfam.-Tanypodinae	255	96	115	146	83	695	139.0	68.9
Ablabesmyia	26	29	34		15	104	20.8	12.1
Conchapelopia	26	10	12		30	77	15.4	12.3
Procladius	204	58	57	146	30	495	99.0	73.1
Zavrelimyia			12		8	19	3.8	5.4
Subfam.-Orthocladiinae	127	145	287	496	128	1183	236.6	159.8
Parakiefferiella					8	8	1.5	3.4
Psectrocladius	102	68	207	485	91	953	190.6	154.8
Stackelbergina		39	57	12	15	123	24.7	23.0
Zalutschia	26	39	23		15	103	20.6	12.9
Subfam.-Chironominae	892	723	746	584	543	3487	697.4	139.1
Tribe-Chironomini	344	646	562	450	339	2341	468.3	134.9
Chironomus		164	138	170	15	487	97.4	83.1
Cryptochironomus		19	12			31	6.2	8.9
Dicrotendipes	64	184	241	219	151	859	171.8	62.0
Endochironomus	13	29				42	8.3	12.8
Lauterborniella					8	8	1.5	3.4
Microtendipes	102	96	57		68	324	64.7	40.7
Omisus			23			23	4.6	10.2
Pagastiella		10		12		22	4.4	6.0
Phaenopsectra		19	12		23	54	10.8	9.5
Polypedilum	13	20	46	37	8	124	24.8	14.4
Pseudochironomus	153	68	23		53	296	59.2	58.5
Stenochironomus					8	8	1.5	3.4
Tribelos		19	12	12	8	51	10.1	7.1
Zavreliella		19				19	3.9	8.6
Tribe-Tanytarsini	548	77	184	134	204	1146	229.2	184.7
Cladotanytarsus	38		23	12	8	81	16.2	14.9
Paratanytarsus		10		24	15	49	9.8	10.4
Tanytarsus/Micropsectra	510	68	161	97	181	1016	203.2	177.3
DIPTERA:Tabanidae	1		2	1		4	0.8	0.8
Chrysops	1		2	1		4	0.8	0.8
DIPTERA:Misc.			1			1	0.2	0.4
Empididae:Hemerodromia			1			1	0.2	0.4
GASTROPODA		1		1	2	4	0.8	0.8
Ferrissia		1		1	2	4	0.8	0.8
BIVALVIA	4	1	2	108	6	121	24.2	46.9
Pisidium	4	1	2	108	6	121	24.2	46.9

PEARCELEY LAKE OCT 31 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
	sub		sub	sub				
OLIGOCHAETA	1	1	2		13	17	3.4	5.4
Enchytraeidae					2	2	0.4	0.9
Nais simplex					1	1	0.2	0.4
Tubificidae + hairs	1	1	2		10	14	2.8	4.1
HIRUDINEA		1				1	0.2	0.4
Erpobdella		1				1	0.2	0.4
DECAPODA	1					1	0.2	0.4
Orconectes	1					1	0.2	0.4
EPHEMEROPTERA	8	45	47	108	12	220	44.0	40.1
Caenis		3			3	6	1.2	1.6
Eurylophella	2	9	2	10	8	31	6.2	3.9
Hexagenia		3				3	0.6	1.3
Leptophlebia	6	30	45	98	1	180	36.0	39.0
ODONATA	2	17	11	14		44	8.8	7.5
Aeshna		1				1	0.2	0.4
Enallagma		1				1	0.2	0.4
Libellula	2	15	11	13		41	8.2	6.0
Somatochlora				1		1	0.2	0.4
HEMIPTERA	4	2		7		13	2.6	3.0
Hesperocorixa				3		3	0.6	1.2
Notonecta	4	2		2		8	1.6	1.7
Sigara				2		2	0.4	0.9
TRICHOPTERA	51	17	46	26	3	143	28.6	20.0
Ceraclea			1			1	0.2	0.4
Molanna	21	4	16	4	3	48	9.6	8.3
Mystacides	27	5	5	3		40	8.0	10.8
Nyctiophylax			3			3	0.6	1.3
Oecetis		5	7	7		19	3.8	3.6
Polycentropus		1				1	0.2	0.4
Ptilostomis		1				1	0.2	0.4
Pycnopsyche	3	1	14	12		30	6.0	6.5
COLEOPTERA			1			1	0.2	0.4
Dineutus			1			1	0.2	0.4
DIPTERA	488	474	376	352	201	1891	378.1	115.5
DIPTERA:Ceratopogonidae	2			1		3	0.6	0.9
Probezzia	2			1		3	0.6	0.9
DIPTERA:Chironomidae	486	474	376	351	201	1888	377.5	115.1
Subfam.-Tanypodinae	34	88	19	14	73	228	45.6	33.2
Ablabesmyia	24	69	8		70	171	34.2	29.8
Conchapelopia	5	4	4	4	1	17	3.4	1.5
Larsia	5					5	1.0	2.2
Procladius		15	8	11	2	35	7.0	6.1
Subfam.-Orthocladiinae	5	22	15	4	12	58	11.5	7.6
Heterotrissocladius		5	4		2	11	2.2	2.2
Psectrocladius	5		4		2	11	2.2	2.0
Stackelbergina		2		4	1	7	1.3	1.5
Zalutschia		15	8		7	30	6.0	5.6
Subfam.-Chironominae	447	364	342	333	116	1602	320.4	122.9
Tribe-Chironomini	428	193	285	316	50	1272	254.3	141.7
Chironomus					2	2	0.4	0.9
Cryptochironomus	5	1			1	7	1.4	2.0
Dicrotendipes	10	24	12	11	3	60	12.0	6.8
Endochironomus		2	4		3	9	1.8	1.7
Glyptotendipes		8		7	1	16	3.2	4.0
Microtendipes	10	38	15	25		87	17.5	14.5
Nilothauma		2				2	0.4	0.9
Pagastiella		1			1	2	0.4	0.5
Paratendipes		4			24	28	5.6	10.4
Phaenopsectra					1	1	0.2	0.4
Polypedilum		19		11	7	37	7.3	8.0
Pseudochironomus		3				3	0.6	1.3
Stictochironomus	175	5	49			229	45.8	75.1
Tribelos	228	86	206	263	7	791	158.2	107.6
Tribe-Tanytarsini	20	171	56	18	66	330	66.1	62.5
Cladotanytarsus	15	75	49	18	48	204	40.8	25.0
Paratanytarsus		3			1	4	0.8	1.3
Tanytarsus/Micropsectra	5	93	8		17	122	24.5	34.7
GASTROPODA				1		1	0.2	0.4
Ferrissia				1		1	0.2	0.4
BIVALVIA		3			1	4	0.8	1.3
Pisidium		3			1	4	0.8	1.2

SKIDWAY LAKE OCT 31 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
	sub	sub	sub	sub	sub			
NEMATODA				1		1	0.2	0.4
Mermithidae				1		1	0.2	0.4
OLIGOCHAETA		1	2			3	0.6	0.9
Ilyodrilus			1			1	0.2	0.4
Lumbriculus		1	1			2	0.4	0.5
HIRUDINEA					1	1	0.2	0.4
Erpobdella					1	1	0.2	0.4
ISOPODA		2	22			24	4.8	9.7
Asellus		2	22			24	4.8	9.7
AMPHIPODA	5	32	19	53		109	21.8	21.5
Crangonyx	4	31	19	43		97	19.4	18.1
Hyalella	1	1		10		12	2.4	4.3
EPHEMEROPTERA	37	111	142	150	4	444	88.8	65.1
Caenis	23	5	44	36	1	109	21.8	18.8
Eurylophella	3	3	8	8		22	4.4	3.5
Leptophlebia	11	103	90	106	3	313	62.6	51.2
ODONATA	27	74	38	39	1	179	35.8	26.3
Cordulia	6	2	2	1		11	2.2	2.3
Enallagma	1	3	9	6	1	20	4.0	3.1
Tetragonuria	1	8	1			10	2.0	3.4
Gomphus		1				1	0.2	0.4
Ischnura	17	53	19	8		97	19.4	20.3
Lestes	1					1	0.2	0.4
Leucorrhinia	1			3		4	0.8	1.2
Libellula		7	7	21		35	7.0	7.7
HEMIPTERA				5		5	1.0	2.2
Hesperocorixa				2		2	0.4	0.9
Sigara				3		3	0.6	1.2
MEGALOPTERA		2				2	0.4	0.9
Sialis		2				2	0.4	0.9
TRICHOPTERA	17	56	21	38	24	156	31.2	16.0
Agrypnia	1		2	3	4	10	2.0	1.4
Hydroptila		1			2	3	0.6	0.9
Nectopsyche		2		2		4	0.8	1.1
Nyctiophylax		2				2	0.4	0.9
Oecetis	1	2	1			4	0.8	0.7
Oxyethira	3	4	5	3	6	21	4.2	1.2
Platycentropus	3	10	3	9		25	5.0	4.3
Polycentropus	4	13	7	9	12	45	9.0	3.3
Pycnopsyche	5	22	3	10		40	8.0	8.6
Triaenodes				2		2	0.4	0.9
COLEOPTERA		1		1		2	0.4	0.5
Dineutus				1		1	0.2	0.4
Donacia		1				1	0.2	0.4
DIPTERA	534	771	1244	1040	861	4451	890.2	269.1
DIPTERA: Ceratopogonidae	19	63	97	11	79	269	53.8	37.5
Bezzia	18	62	97	11	79	267	53.4	33.7
Dasyhelea		1				1	0.2	0.4
Monohelea	1					1	0.2	0.4
DIPTERA: Chironomidae	515	708	1146	1029	782	4181	836.2	252.8
Subfam.-Tanypodinae	36	78	161	175	180	630	125.9	65.0
Ablabesmyia	5		35	93		133	26.6	35.7
Conchapelopia	10	21	12	10		53	10.7	7.5
Guttipelopia			12			12	2.3	5.1
Larsia		14	12	31		57	11.3	12.7
Natarsia			23			23	4.6	10.2
Procladius	21	43	69	41	180	353	70.6	63.4
Subfam.-Orthocladiinae		21	23	41	313	398	79.6	131.2
Paracladius		7				7	1.4	3.2
Psectrocladius		14	23	41	313	391	78.2	118.2
Subfam.-Chironominae	479	609	963	813	289	3153	630.6	266.2
Tribe-Chironomini	454	404	860	731	258	2705	541.1	247.1
Chironomus	98	92	252	237	31	710	142.0	97.2
Cryptochironomus		7				7	1.4	3.2
Dicrotendipes	5		23	10	16	54	10.8	8.1
Endochironomus		14	12	21	8	54	10.8	7.6
Lauterborniella	5	21	12	31		69	13.8	12.4
Microtendipes	77	57	138	185		457	91.3	71.9
Nilothauma		14	12			26	5.1	7.1
Omisus	134		287			420	84.1	127.1
Polypedilum	5	21	36	31	16	109	21.8	11.0
Tribelos	129	177	69	134	180	688	137.7	45.2
Zavreliella			23	82	8	113	22.6	34.7
Tribe-Tanytarsini	26	205	103	82	31	448	89.6	72.6
Cladotanytarsus					8	8	1.6	3.5
Paratanytarsus	5					5	1.0	2.3
Tanytarsus/Micropsectra	21	205	103	82	24	435	87.0	75.4
DIPTERA: Tabanidae			1			1	0.2	0.4
Chrysops			1			1	0.2	0.4
BIVALVIA		11	7	40		58	11.6	16.6
Pisidium		11	7	40		58	11.6	16.6

WESTWARD LAKE OCT 30 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
	sub		sub					
TURBELLARIA	51					51	10.2	22.8
Dugesia	51					51	10.2	22.8
NEMATODA	40	1	2	2	2	47	9.4	17.1
Anatonchus	40	1	2	1	2	46	9.2	17.2
Mermithidae				1		1	0.2	0.4
OLIGOCHAETA	169	7	13	13	14	216	43.2	70.4
Arteonais		2				2	0.4	0.9
Enchytraeidae	164	1	1	8	9	183	36.6	71.3
Ilyodrilus		2				2	0.4	0.9
Lumbriculus	3	2	8	2	2	17	3.4	2.6
Lumbriculidae			1	1		2	0.4	0.5
Nais	2					2	0.4	0.8
Slavania			1			1	0.2	0.4
Tubificidae + hairs			1	2	1	4	0.8	0.8
Tubificidae - hairs			1		2	3	0.6	0.9
HIRUDINEA				1		1	0.2	0.4
Erpobdella				1		1	0.2	0.4
AMPHIPODA	300	21	124	112	63	620	124.0	106.6
Crangonyx		4	10	13	2	29	5.8	5.5
Hyalella	300	17	114	99	61	591	118.2	108.3
DECAPODA		1				1	0.2	0.4
Cambarus		1				1	0.2	0.4
EPHEMEROPTERA	105	42	240	127	260	774	154.8	92.6
Caenis			46	16	127	189	37.8	53.3
Eurylophella	105	36	163	96	120	520	104.0	45.9
Leptophlebia		3	31	6	13	53	10.6	12.4
Stenacron				8		8	1.6	3.6
Stenonema		3		1		4	0.8	1.3
ODONATA	12	1	5		1	19	3.8	5.0
Aeshna			1			1	0.2	0.4
Enallagma	8		3			11	2.2	3.5
Gomphus	4	1				5	1.0	1.7
Somatochlora			1		1	2	0.4	0.5
HEMIPTERA			6			6	1.2	2.7
Notonecta			6			6	1.2	2.7
MEGALOPTERA			6		1	7	1.4	2.6
Sialis			6		1	7	1.4	2.6
TRICHOPTERA	8		26	6	1	41	8.2	10.5
Agarodes				1		1	0.2	0.4
Banksiola			5			5	1.0	2.2
Lepidostoma				1		1	0.2	0.4
Molanna	1				1	2	0.4	0.5
Nectopsyche	1		5	1		7	1.4	1.9
Nyctiophylax				1		1	0.2	0.4
Oecetis	6		7			13	2.6	3.2
Polycentropus				1		1	0.2	0.4
Ptilostomis			1			1	0.2	0.4
Pycnopsyche			7	1		8	1.6	3.0
Triaenodes			1			1	0.2	0.4
LEPIDOPTERA	11				1	12	2.4	4.3
Eoparargyractis	11				1	12	2.4	4.8
COLEOPTERA	42		11	14	16	83	16.6	15.5
Ectopria				1		1	0.2	0.4
Hydroporus			10			10	2.0	4.5
Stenelmis	42		1	13	16	72	14.4	17.0

WESTWARD LAKE OCT 30 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
	sub		sub					
DIPTERA	1587	125	1471	237	308	3728	745.6	719.3
DIPTERA: Ceratopogonidae	396	4	6	6	9	421	84.2	174.3
Bezzia	82	1	5		5	93	18.6	31.8
Dasyhelea	298	1	5		6	310	62.0	118.0
Palpomyia		1				1	0.2	0.4
Probezzia	16	2	1	6	3	28	5.6	6.1
DIPTERA: Chironomidae	1191	121	1465	231	299	3307	661.4	619.5
Subfam.-Tanypodinae	24	28	104	18	18	191	38.3	36.8
Ablabesmyia	12	12	15	6	12	57	11.4	2.9
Clinotanypus		1				1	0.2	0.4
Conchapelopia					1	1	0.2	0.4
Larsia				3		3	0.6	1.3
Procladius	12	15	89	8	5	129	25.7	35.5
Zavrelimyia `				1		1	0.2	0.4
Subfam.-Prodiamesinae				2	2	4	0.8	1.1
Monodiamesa				2	2	4	0.8	1.1
Subfam.-Orthocladiinae	48	12		29	24	113	22.5	18.0
Corynoneura		1		3	1	5	1.0	1.2
Heterotrissocladius		1		18	2	21	4.2	6.9
Parakiefferiella	24	9		4	2	39	7.8	8.6
Parametriocnemus				1		1	0.2	0.4
Psectrocladius		1		1	6	8	1.6	2.2
Synorthocladius				1		1	0.2	0.4
Thienemanniella	12					12	2.4	5.3
Xylotopus				1		1	0.2	0.4
Zalutschia	12				13	25	5.0	6.8
Subfam.-Chironominae	1119	81	1362	182	255	2999	599.8	594.3
Tribe-Chironomini	417	49	814	101	183	1564	312.8	313.6
Chironomus		8		1		9	1.8	3.5
Cladopelma				4		4	0.8	1.8
Cryptochironomus	12			2	2	16	3.2	5.0
Dicrotendipes	12	1	488	36	46	583	116.6	186.4
Glyptotendipes			15	1		16	3.2	6.5
Lauterborniella				1		1	0.2	0.4
Microtendipes	48	1	252	5	22	327	65.4	105.7
Nilothauma		1			4	5	1.0	1.5
Paratendipes		19		23		42	8.4	11.6
Phaenopsectra			15	4		19	3.8	5.8
Polypedilum		2	15	2	3	22	4.4	5.4
Pseudochironomus	36		30		106	172	34.4	38.8
Stenochironomus				1		1	0.2	0.4
Stictochironomus	310	13		5		328	65.5	136.6
Tribelos		4		16		20	4.0	6.9
Tribe-Tanytarsini	703	32	548	81	72	1435	287.0	314.0
Cladotanytarsus	238	1	104	37	51	431	86.2	92.6
Paratanytarsus	286	5		7	7	305	61.0	125.7
Stempellina	24					24	4.8	10.6
Stempellinella		1		5		6	1.2	2.2
Tanytarsus/Micropsectra	155	25	444	32	14	670	134.0	163.2
GASTROPODA	9	1			6	16	3.2	4.1
Amnicola	9				1	10	2.0	3.9
Ferrissia		1			5	6	1.2	2.2
BIVALVIA	460	1	56	20	29	566	113.2	194.9
Pisidium	460	1	56	20	29	566	113.2	174.3

YOUNG LAKE NOV 6 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
	sub		sub	sub				
TURBELLARIA			6		11	17	3.4	5.0
Dugesia			6		11	17	3.4	5.0
NEMATODA	1		6	1	2	10	2.0	2.3
Anatonchus			5	1	1	7	1.4	2.1
Mermithidae	1		1		1	3	0.6	0.5
OLIGOCHAETA	6	10	34	42	53	145	29.0	20.4
Enchytraeidae	2	4	4	2	16	28	5.6	5.9
Lumbriculus	1	6	8	1	10	26	5.2	4.1
Lumbriculidae			2		1	3	0.6	0.9
Tubificidae + hairs	1		18	35	26	80	16.0	15.4
Tubificidae - hairs	2		2	4		8	1.6	1.7
HIRUDINEA	1	2			1	4	0.8	0.8
Erpobdella		2			1	3	0.6	0.9
Helobdella	1					1	0.2	0.4
AMPHIPODA	505	594	882	833	620	3434	686.8	162.5
Crangonyx	7	12	18	1	2	40	8.0	7.1
Hyalella	498	582	864	832	618	3394	678.8	160.9
DECAPODA		1				1	0.2	0.4
Orconectes		1				1	0.2	0.4
HYDRACARINA			1			1	0.2	0.4
Arrenurus			1			1	0.2	0.4
EPHEMEROPTERA	89	17	34	37	93	270	54.0	34.7
Caenis	34	1		7	27	69	13.8	15.7
Ephemera	8				4	12	2.4	3.6
Eurylophella	11		1	2	11	25	5.0	4.9
Hexagenia	1					1	0.2	0.4
Leptophlebia	32	15	24	23	45	139	27.8	11.3
Siphloplecton			5			5	1.0	2.2
Stenacron	1		1			2	0.4	0.5
Stenonema	2	1	3	5	6	17	3.4	2.1
ODONATA	50	36	3	66	45	200	40.0	23.4
Dromogomphus	1	1				2	0.4	0.5
Enallagma	37	32	3	53	38	163	32.6	16.4
Tetragonuria	2	1			7	10	2.0	2.9
Gomphus	10	1		9		20	4.0	5.0
Ischnura				4		4	0.8	1.8
Nasiaeschna		1				1	0.2	0.4
MEGALOPTERA			3			3	0.6	1.3
Sialis			3			3	0.6	1.3
TRICHOPTERA	17	34	24	38	15	128	25.6	10.2
Agarodes	4	6	2	8	5	25	5.0	2.2
Lepidostoma	1			1		2	0.4	0.5
Leptoceridae			2		2	4	0.8	1.1
Molanna	1	1	4	4	2	12	2.4	1.5
Mystacides		7	3	2	1	13	2.6	2.7
Nectopsyche		1				1	0.2	0.4
Oecetis	6	3	6	11	5	31	6.2	2.6
Oxyethira				4		4	0.8	1.8
Phylocentropus	1		1			2	0.4	0.5
Polycentropus			4			4	0.8	1.8
Pycnopsyche	3	15	1	6		25	5.0	6.0
Triaenodes	1	1	1	2		5	1.0	0.7
LEPIDOPTERA	1	1	4		1	7	1.4	1.5
Eoparargyractis	1	1	4		1	7	1.4	1.5
COLEOPTERA	34	53	71	17	67	242	48.4	22.8
Berosus	2	1	5	15	8	31	6.2	5.6
Dineutus	2				1	3	0.6	0.9
Dubiraphia	1	23	4		27	55	11.0	12.9
Ectopria		2				2	0.4	0.9
Haliplus		4				4	0.8	1.8
Macronychus	12	3			4	19	3.8	4.9
Scirtes			1			1	0.2	0.4
Stenelmis	17	20	61	2	27	127	25.4	21.9

YOUNG LAKE NOV 6 1989

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
	sub		sub	sub				
DIPTERA	546	63	550	1198	290	2647	529.3	425.0
DIPTERA:Ceratopogonidae	6	2	40	21	35	104	20.8	16.9
Bezzia		2	1	17	9	29	5.8	6.4
Dasyhelea			1		3	4	0.8	1.3
Probezzia	6		38	4	23	71	14.2	15.9
DIPTERA:Chironomidae	540	61	510	1176	254	2541	508.1	421.8
Subfam.-Tanypodinae	88	32	291	306	150	867	173.3	121.5
Ablabesmyia		2	5	36	8	51	10.2	13.2
Clinotanypus			5	24		29	5.7	10.2
Conchapelopia	18	15	20		25	78	15.6	9.5
Djalmabatista			15		48	63	12.7	20.8
Larsia	11	10	51	94	43	209	41.8	34.6
Procladius	59	5	194	153	19	430	86.0	83.4
Thienemannimyia					7	7	1.4	3.1
Subfam.-Diamesinae					1	1	0.2	0.4
Potthastia					1	1	0.2	0.4
Subfam.-Orthocladiinae	6	2	77	71	30	185	37.0	35.1
Heterotrissocladius			26		11	37	7.4	10.2
Limnophyes		1				1	0.2	0.4
Psectrocladius	6	1	51		19	77	15.4	19.0
Zalutschia				71		71	14.1	31.6
Subfam.-Chironominae	445	27	143	800	73	1488	297.6	324.6
Tribe-Chironomini	249	23	92	118	40	522	104.4	89.6
Cryptochironomus			36	12	5	53	10.5	14.9
Demicryptochironomus		1			1	2	0.4	0.5
Dicrotendipes	6		10	24	9	49	9.8	7.9
Glyptotendipes	6	2		47	1	56	11.2	18.0
Microtendipes		2		12	3	17	3.4	4.9
Nilothauma	12		5			17	3.4	5.2
Pagastiella	12	1	5	12		30	6.0	5.7
Polypedilum	24	9	10		11	54	10.8	7.7
Pseudochironomus	214	11	15	12	15	267	53.4	80.3
Stenochironomus		3				3	0.6	1.3
Stictochironomus		2	20		5	27	5.5	8.6
Tribelos		1				1	0.2	0.4
Zavreliella					1	1	0.2	0.4
Tribe-Tanytarsini	196	4	51	682	33	966	193.2	283.1
Cladotanytarsus	190	3	15	517	13	739	147.8	220.8
Stempellina					1	1	0.2	0.4
Stempellinella			5			5	1.0	2.3
Tanytarsus/Micropsectra	6	1	31	165	19	221	44.2	68.3
DIPTERA:Tipulidae				1		1	0.2	0.4
Erioptera				1		1	0.2	0.4
DIPTERA:Misc.					1	1	0.2	0.4
Empididae.Hemerodromia					1	1	0.2	0.4
GASTROPODA	25	25	12	62	32	156	31.2	18.7
Amnicola	24	22	9	56	20	131	26.2	17.6
Campeloma			1			1	0.2	0.4
Ferrissia			1		1	2	0.4	0.5
Helisoma					3	3	0.6	1.3
Menetus	1	3	1	2	8	15	3.0	2.9
Physella				4		4	0.8	1.8
BIVALVIA	3	5	6	18	24	56	11.2	9.3
Pisidium	3	5	6	18	24	56	11.2	8.3

APPENDIX 6

FALL 1989 BENTHOS SUMMARY BY TAXONOMIC ORDER OR SUB-FAMILY

BLUE CHALK LAKE NOV 25 1989

NUMBER OF GENERA

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
TURBELLARIA	1					1
NEMATODA	2	2	2			2
OLIGOCHAETA	4	4	3	1	3	6
HIRUDINEA				1		1
AMPHIPODA	1	1	1	1	2	2
EPHEMEROPTERA	5	5	5	5	4	7
ODONATA	3	2	7	3	2	8
PLECOPTERA	1					1
HEMIPTERA			1			1
TRICHOPTERA	6	2	6	4	7	10
COLEOPTERA	3	3	3	2	1	5
DIPTERA TOTAL	28	29	23	22	24	40
DIPTERA:Ceratopogonidae	3	3	2		1	4
DIPTERA:Chironomidae	24	26	21	22	23	35
Subfam.-Tanypodinae	7	7	7	6	6	8
Subfam.-Orthocladiinae	4	6	3	4	3	7
Subfam.-Chironominae	13	13	11	12	14	20
Tribe-Chironomini	8	10	8	10	10	15
Tribe-Tanytarsini	5	3	3	2	4	5
DIPTERA:Misc.	1				1	1
GASTROPODA	1			1	1	2
BIVALVIA	1	1	2	1	1	2
TOTAL GENERA	56	49	53	41	45	88

NUMBER OF INDIVIDUALS

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
TURBELLARIA	7					7
NEMATODA	10	3	6			19
OLIGOCHAETA	70	21	11	3	8	113
HIRUDINEA				2		2
AMPHIPODA	185	194	222	132	181	914
EPHEMEROPTERA	88	26	87	68	29	298
ODONATA	12	3	17	6	9	47
PLECOPTERA	1					1
HEMIPTERA			1			1
TRICHOPTERA	12	5	13	22	12	64
COLEOPTERA	65	10	28	2	4	109
DIPTERA TOTAL	382	248	166	112	279	1187
DIPTERA:Ceratopogonidae	39	8	4		2	53
DIPTERA:Chironomidae	341	240	162	112	276	1131
Subfam.-Tanypodinae	210	138	89	36	161	634
Subfam.-Orthocladiinae	17	13	7	13	17	67
Subfam.-Chironominae	114	89	66	63	98	430
Tribe-Chironomini	21	76	24	34	43	198
Tribe-Tanytarsini	93	13	42	29	55	232
DIPTERA:Misc.	2				1	3
GASTROPODA	1			1	1	3
BIVALVIA	12	2	3	2	1	20
TOTAL INDIVIDUALS	845	512	554	350	524	2785

CLEAR LAKE NOV 8 1989

	SITE					TOTAL
TAXONOMIC NAME	1	2	3	4	5	
	sub	sub	sub		sub	
NEMATODA		1	1	1	1	2
OLIGOCHAETA	2	3	2	2		3
HIRUDINEA	1					1
AMPHIPODA	2	2	2	2	2	2
EPHEMEROPTERA	4	5	3	4	4	5
ODONATA	2	4	4	5	6	12
MEGALOPTERA		1	1		1	1
TRICHOPTERA	7	9	10	8	7	14
LEPIDOPTERA			1			1
COLEOPTERA	2	1	1			3
DIPTERA TOTAL	21	17	18	14	12	31
DIPTERA:Ceratopogonidae	2	2	2	1	1	2
DIPTERA:Chironomidae	17	15	15	13	11	26
Subfam.-Tanypodinae	2	4	4	2	1	4
Subfam.-Prodiamesinae		1				1
Subfam.-Orthocladiinae	6		2	1		6
Subfam.-Chironominae	9	10	9	10	10	15
Tribe-Chironomini	6	9	9	9	8	12
Tribe-Tanytarsini	3	1		1	2	3
DIPTERA:Tipulidae	1					1
DIPTERA:Misc.	1		1			2
GASTROPODA		1	1	2		2
BIVALVIA	1		1	1	1	1
TOTAL GENERA	42	44	45	39	34	78

	SITE					TOTAL
TAXONOMIC NAME	1	2	3	4	5	
	sub	sub	sub		sub	
NEMATODA		1	1	1	1	4
OLIGOCHAETA	8	38	6	17		69
HIRUDINEA	2					2
AMPHIPODA	74	814	498	920	180	2486
EPHEMEROPTERA	207	111	24	213	29	584
ODONATA	4	7	38	20	16	85
MEGALOPTERA	0	3	3	0	13	19
TRICHOPTERA	32	97	82	42	22	275
LEPIDOPTERA			15			15
COLEOPTERA	6	1	12			19
DIPTERA TOTAL	518	201	408	45	283	1455
DIPTERA:Ceratopogonidae	37	8	31	9	9	94
DIPTERA:Chironomidae	479	193	376	36	274	1358
Subfam.-Tanypodinae	29	29	117	4	3	181
Subfam.-Prodiamesinae		6				6
Subfam.-Orthocladiinae	134		8	1		143
Subfam.-Chironominae	316	158	252	31	271	1029
Tribe-Chironomini	288	156	252	29	99	823
Tribe-Tanytarsini	29	2		2	173	205
DIPTERA:Tipulidae	1					1
DIPTERA:Misc.	1		1			2
GASTROPODA		1	1	10		12
BIVALVIA	22		4	4	3	33
TOTAL INDIVIDUALS	873	1274	1092	1272	547	5058

CRADLE LAKE NOV 7 1989

NUMBER OF GENERA

TAXONOMIC NAME	SITE 1	2	3	4	5	TOTAL
NEMATODA					1	1
OLIGOCHAETA	1	1			2	2
HIRUDINEA			1	2	1	2
AMPHIPODA	1	2	2	2	2	2
EPHEMEROPTERA	2	1	1	2	4	4
ODONATA	1	3	2		5	7
HEMIPTERA	1	3	1	2	2	4
MEGALOPTERA					1	1
TRICHOPTERA	3	6	2	4	4	8
COLEOPTERA		1		1	1	3
DIPTERA TOTAL	11	13	14	11	16	26
DIPTERA:Ceratopogonidae	2	2	2	1	2	4
DIPTERA:Chironomidae	9	10	12	10	14	21
Subfam.-Tanypodinae	2	2	2	2	4	4
Subfam.-Orthocladiinae	1	1	1		3	3
Subfam.-Chironominae	6	7	9	8	7	14
Tribe-Chironomini	5	5	7	7	5	11
Tribe-Tanytarsini	1	2	2	1	2	3
DIPTERA:Chaoboridae		1				1
BIVALVIA		1	1	1	1	1
TOTAL GENERA	20	31	24	25	40	61

NUMBER OF INDIVIDUALS

TAXONOMIC NAME	SITE 1	2	3	4	5	TOTAL
NEMATODA					2	
OLIGOCHAETA	1	1			5	
HIRUDINEA			2	3	2	
AMPHIPODA	76	15	34	18	81	22
EPHEMEROPTERA	2	2	1	5	159	16
ODONATA	1	8	4		46	5
HEMIPTERA	2	7	4	2	3	1
MEGALOPTERA					1	
TRICHOPTERA	6	18	2	12	9	4
COLEOPTERA		1		1	7	
DIPTERA TOTAL	42	96	65	108	371	68
DIPTERA:Ceratopogonidae	4	9	2	3	21	3
DIPTERA:Chironomidae	38	86	63	105	350	64
Subfam.-Tanypodinae	4	27	6	21	16	7
Subfam.-Orthocladiinae	4	6	3		97	11
Subfam.-Chironominae	30	53	54	84	237	45
Tribe-Chironomini	23	47	48	81	147	34
Tribe-Tanytarsini	7	6	6	3	90	11
DIPTERA:Chaoboridae		1				
BIVALVIA		1	1	5	5	1
TOTAL INDIVIDUALS	130	149	113	154	691	123

CROSSON LAKE OCT 26 1989

TAXONOMIC NAME	SITE 1 sub	2 sub	3 sub	4 sub	5 sub	TOTAL
TURBELLARIA	1		1	1		1
NEMATODA	2	1	2	2		3
OLIGOCHAETA	3	6	7	3	2	9
HIRUDINEA	1			1		2
AMPHIPODA	2	1	1	2	2	2
HYDRACARINA		2	2	3	2	5
COLLEMBOLA			1	1		1
EPHEMEROPTERA	6	5	5	5	3	6
ODONATA	4	6	6	4	5	8
HEMIPTERA					1	1
MEGALOPTERA		1		1		1
TRICHOPTERA	7	6	11	7	2	14
COLEOPTERA	3	4	4	3	2	5
DIPTERA TOTAL	21	20	24	20	16	35
DIPTERA:Ceratopogonidae	2	2	3	1	1	3
DIPTERA:Chironomidae	19	18	19	19	15	30
Subfam.-Tanypodinae	6	5	3	5	4	7
Subfam.-Orthocladiinae	4	3	4	3	3	5
Subfam.-Chironominae	9	10	12	11	8	18
Tribe-Chironomini	6	5	9	9	5	13
Tribe-Tanytarsini	3	5	3	2	3	5
DIPTERA:Tabanidae			1			1
DIPTERA:Tipulidae			1			1
GASTROPODA	2	3	1	3	1	3
BIVALVIA	1	1	1	1	1	1
TOTAL GENERA	53	56	66	57	37	97

TAXONOMIC NAME	SITE 1 sub	2 sub	3 sub	4 sub	5 sub	TOTAL
TURBELLARIA	2		1	1		
NEMATODA	2	5	4	4		1
OLIGOCHAETA	17	10	15	5	2	4
HIRUDINEA	1			1		
AMPHIPODA	153	140	245	150	126	81
HYDRACARINA		12	3	4	6	2
COLLEMBOLA			2	1		
EPHEMEROPTERA	223	251	120	87	81	76
ODONATA	17	22	30	19	60	14
HEMIPTERA					1	
MEGALOPTERA		5		1		
TRICHOPTERA	18	22	29	29	5	10.
COLEOPTERA	80	123	6	99	20	32.
DIPTERA TOTAL	594.7	563	706	365	856	3083.
DIPTERA:Ceratopogonidae	9	12	18	5	16	6
DIPTERA:Chironomidae	585.7	550.5	686	360	839.6	3021.
Subfam.-Tanypodinae	134.8	198	175	137	336	980.
Subfam.-Orthocladiinae	158.1	88	175	61	126	60
Subfam.-Chironominae	292.8	264	336	162	378	143.
Tribe-Chironomini	111.4	88	147	126	193	665.
Tribe-Tanytarsini	181.4	176	189	36	185	767.
DIPTERA:Tabanidae			1			
DIPTERA:Tipulidae			1			
GASTROPODA	33	16	1	4	11	6
BIVALVIA	2	1	3	2	6	1
TOTAL INDIVIDUALS	1143	1170	1165	772	1174	5422.

DELANO LAKE NOV 8 1989

NUMBER OF GENERA

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
			sub	sub		
NEMATODA		1	1			1
OLIGOCHAETA		2	2			3
HIRUDINEA	1		2			3
AMPHIPODA	2	2	2	2	2	2
HYDRACARINA			2		1	3
EPHEMEROPTERA	5	5	4	3	5	5
ODONATA	5	7	4	8	5	10
HEMIPTERA			1	1		2
TRICHOPTERA	7	3	6	10	3	12
COLEOPTERA	2	4	3	4	1	8
DIPTERA TOTAL	28	20	18	16	18	41
DIPTERA:Ceratopogonidae	1		3	1	1	3
DIPTERA:Chironomidae	26	20	13	15	17	36
Subfam.-Tanypodinae	6	6	5	5	4	8
Subfam.-Orthocladiinae	5	3	1	2	3	8
Subfam.-Chironominae	15	11	7	8	10	20
Tribe-Chironomini	12	8	5	6	8	17
Tribe-Tanytarsini	3	3	2	2	2	3
DIPTERA:Tabanidae	1		1			1
DIPTERA:Tipulidae			1			1
GASTROPODA	2	1	3	2	1	3
BIVALVIA	1	1	1	1		2
TOTAL GENERA	53	46	49	47	36	95

NUMBER OF INDIVIDUALS

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
			sub	sub		
NEMATODA		1	2			3
OLIGOCHAETA		16	31			47
HIRUDINEA	1		17			18
AMPHIPODA	311	196	18	29	151	705
HYDRACARINA			3		1	4
EPHEMEROPTERA	159	142	131	302	124	858
ODONATA	27	33	13	36	20	129
HEMIPTERA			1	2		3
TRICHOPTERA	14	22	62	29	5	132
COLEOPTERA	34	17	3	118	3	175
DIPTERA TOTAL	298	157	1203	688	104	2450
DIPTERA:Ceratopogonidae	11		107	21	2	141
DIPTERA:Chironomidae	286	157	1092	667	102	2304
Subfam.-Tanypodinae	114	43	303	166	22	647
Subfam.-Orthocladiinae	13	19	65	19	3	119
Subfam.-Chironominae	159	95	724	483	77	1538
Tribe-Chironomini	114	52	573	295	30	1064
Tribe-Tanytarsini	45	43	151	188	47	474
DIPTERA:Tabanidae	1		1			2
DIPTERA:Tipulidae			3			3
GASTROPODA	22	18	96	28	20	184
BIVALVIA	11	10	12	16		49
TOTAL INDIVIDUALS	877	612	1592	1248	428	4756 6

HAMER LAKE NOV 1 1989

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
NEMATODA		1				1
OLIGOCHAETA	2	2	1		1	2
HIRUDINEA					1	1
AMPHIPODA	2	2	2	2	2	3
HYDRACARINA	1	3	1	3	2	5
EPHEMEROPTERA	3	4	3	3	3	4
ODONATA	10	11	11	9	9	14
HEMIPTERA		1		2		2
MEGALOPTERA	1	1				1
NEUROPTERA		1				1
TRICHOPTERA	9	6	10	8	9	12
LEPIDOPTERA		1				1
COLEOPTERA	1	1		3	1	3
DIPTERA TOTAL	28	26	22	23	28	38
DIPTERA:Ceratopogonidae	5	2	2	3	4	5
DIPTERA:Chironomidae	22	24	20	20	24	32
Subfam.-Tanypodinae	5	6	4	5	6	6
Subfam.-Diamesinae	1		1		1	1
Subfam.-Orthocladiinae	2	2	3	2	1	5
Subfam.-Chironominae	14	16	12	13	16	20
Tribe-Chironomini	11	13	11	10	13	17
Tribe-Tanytarsini	3	3	1	3	3	3
DIPTERA:Tabanidae	1					1
GASTROPODA	2	2		1		2
BIVALVIA	1	1	1	1	1	1
TOTAL GENERA	60	63	51	55	57	91

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
NEMATODA		1				1
OLIGOCHAETA	3	4	3		3	13
HIRUDINEA					1	1
AMPHIPODA	234	388	94	679	136	1531
HYDRACARINA	2	3	1	6	4	16
EPHEMEROPTERA	116	229	872	264	71	1552
ODONATA	70	70	101	116	32	389
HEMIPTERA		1		21		22
MEGALOPTERA	4	11				15
NEUROPTERA		1				1
TRICHOPTERA	65	66	141	55	93	420
LEPIDOPTERA		1				1
COLEOPTERA	1	5		9	2	17
DIPTERA TOTAL	479	485	294	285	605	2148
DIPTERA:Ceratopogonidae	154	156	27	73	62	472
DIPTERA:Chironomidae	323	329	267	212	543	1674
Subfam.-Tanypodinae	117	123	43	133	96	512
Sufam.-Diamesinae	1		2		2	5
Subfam.-Orthocladiinae	6	9	48	30	83	176
Subfam.-Chironominae	200	197	176	49	364	986
Tribe-Chironomini	191	177	175	44	332	919
Tribe-Tanytarsini	9	20	1	5	32	67
DIPTERA:Tabanidae	2					2
GASTROPODA	3	4		1		8
BIVALVIA	19	1	18	11	33	82
TOTAL INDIVIDUALS	996	1270	1524	1447	980	6217

HARP LAKE OCT 23 1989

NUMBER OF GENERA

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
COELENTERATA				1		1
TURBELLARIA		1	1	1	1	1
NEMATODA	3	2			1	3
OLIGOCHAETA	2	2	3	4	4	7
HIRUDINEA	1					1
AMPHIPODA	2	1	1	1	1	2
HYDRACARINA	1	3	1		1	5
EPHEMEROPTERA	3	2	2	4	4	5
ODONATA	6	2	5	2	2	8
TRICHOPTERA	7	5	3	5	6	13
LEPIDOPTERA	1					1
COLEOPTERA	2	2	1	1	1	3
DIPTERA TOTAL	30	22	18	24	28	44
DIPTERA:Ceratopogonidae	2	3	3	3	3	5
DIPTERA:Chironomidae	27	19	15	21	25	38
Subfam.-Tanypodinae	5	5	4	5	6	7
Subfam.-Prodiamesinae	1	1	1	1	1	1
Subfam.-Orthocladiinae	4	3	5	4	4	7
Subfam.-Chironominae	17	10	5	11	14	23
Tribe-Chironomini	13	7	4	8	12	18
Tribe-Tanytarsini	4	3	1	3	2	5
DIPTERA:Tabanidae	1					1
GASTROPODA	2	2	1	1	2	3
BIVALVIA	1	1	1	1	1	1
TOTAL GENERA	61	45	37	45	52	98

NUMBER OF INDIVIDUALS

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
COELENTERATA				1		
TURBELLARIA		3	1	11	1	1
NEMATODA	8	4			1	1
OLIGOCHAETA	8	9	12	6	7	4
HIRUDINEA	1					
AMPHIPODA	378	180	105	52	102	81
HYDRACARINA	1	3	1		5	1
EPHEMEROPTERA	37	3	6	32	69	14
ODONATA	45	21	34	4	18	12
TRICHOPTERA	23	9	7	8	10	5
LEPIDOPTERA	2					
COLEOPTERA	13	49	2	4	17	8
DIPTERA TOTAL	421	114	108	163	374	118
DIPTERA:Ceratopogonidae	28	9	18	23	29	10
DIPTERA:Chironomidae	391	105	90	140	345	107
Subfam.-Tanypodinae	42	28	28	45	87	23
Subfam.-Prodiamesinae	1	3	5	12	8	2
Subfam.-Orthocladiinae	61	9	5	4	50	12
Subfam.-Chironominae	287	65	52	79	200	68
Tribe-Chironomini	201	50	9	48	133	44
Tribe-Tanytarsini	86	15	43	31	67	24
DIPTERA:Tabanidae	2					
GASTROPODA	137	36	1	20	37	23
BIVALVIA	15	11	24	19	28	9
TOTAL INDIVIDUALS	1089	442	301	320	669	282

HENEY LAKE OCT 26 1989

TAXONOMIC NAME	SITE					TOTAL
	1 sub	2	3 sub	4 sub	5 sub	
TURBELLARIA		1			1	1
NEMATODA	2		1			2
OLIGOCHAETA	2	1	3	5	3	7
HIRUDINEA	1	1			3	3
AMPHIPODA	2	1	2	2	2	2
HYDRACARINA	3				1	4
EPHEMEROPTERA	3	3	3	3	4	4
ODONATA	5	3	7	5	5	9
TRICHOPTERA	2	3	3	2	3	8
COLEOPTERA		1	1	1	2	2
DIPTERA TOTAL	13	21	21	15	21	30
DIPTERA:Ceratopogonidae	1	1	2	1	1	2
DIPTERA:Chironomidae	12	20	19	14	20	28
Subfam.-Tanypodinae	3	4	4	3	5	6
Subfam.-Orthocladiinae	1	2	3	2	3	4
Subfam.-Chironominae	8	14	12	9	12	18
Tribe-Chironomini	5	10	10	7	9	14
Tribe-Tanytarsini	3	4	2	2	3	4
GASTROPODA		1	2	1	2	3
BIVALVIA	1	1	1	1	2	2
TOTAL GENERA	34	37	44	35	49	77

TAXONOMIC NAME	SITE					TOTAL
	1 sub	2	3 sub	4 sub	5 sub	
TURBELLARIA		1			1	
NEMATODA	2		1			
OLIGOCHAETA	5	1	6	6	4	2
HIRUDINEA	2	1			4	
AMPHIPODA	60	22	83	100	22	28
HYDRACARINA	7				3	1
EPHEMEROPTERA	60	24	35	72	118	30
ODONATA	24	8	42	85	14	17
TRICHOPTERA	3	3	13	2	6	2
COLEOPTERA		1	1	3	32	3
DIPTERA TOTAL	1076	173	487	1589	448	377
DIPTERA:Ceratopogonidae	19	6	16	22	12	7
DIPTERA:Chironomidae	1057	167	471	1567	436	369
Subfam.-Tanypodinae	138	41	85	361	70	69
Subfam.-Orthocladiinae	85	26	155	439	78	78
Subfam.-Chironominae	835	100	231	768	288	2221
Tribe-Chironomini	307	62	184	596	209	135
Tribe-Tanytarsini	529	38	47	172	78	864
GASTROPODA		1	10	1	6	1
BIVALVIA	2	3	7	16	2	30
TOTAL INDIVIDUALS	1241	238	685	1874	660	469

PLASTIC LAKE OCT 24 1989

NUMBER OF GENERA

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
TURBELLARIA	1				1	1
NEMATODA	1	1			1	2
OLIGOCHAETA	2	1	3		1	3
HIRUDINEA			1			1
AMPHIPODA	1	1	1	1	1	1
EPHEMEROPTERA	1	1	2	1	2	2
ODONATA	3	3	6	4	1	7
TRICHOPTERA	2		10	5	6	10
DIPTERA TOTAL	25	20	31	22	20	33
DIPTERA:Ceratopogonidae	2	2	3	2	2	3
DIPTERA:Chironomidae	23	18	28	20	18	30
Subfam.-Tanypodinae	4	3	6	5	4	6
Subfam.-Orthocladiinae	3	4	5	3	2	5
Subfam.-Chironominae	16	11	17	12	12	19
Tribe-Chironomini	13	8	14	9	9	16
Tribe-Tanytarsini	3	3	3	3	3	3
GASTROPODA	2		1	1	1	2
BIVALVIA	1	1	1	1	1	1
TOTAL GENERA	39	28	56	35	35	63

NUMBER OF INDIVIDUALS

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
TURBELLARIA	1				1	2
NEMATODA	1	1			1	3
OLIGOCHAETA	6	2	12		1	21
HIRUDINEA			1			1
AMPHIPODA	37	8	3	18	40	106
EPHEMEROPTERA	13	6	13	11	6	49
ODONATA	9	6	14	8	1	38
TRICHOPTERA	3		20	5	11	39
DIPTERA TOTAL	240	271	711	134	188	1544
DIPTERA:Ceratopogonidae	6	10	47	5	11	79
DIPTERA:Chironomidae	234	261	664	129	177	1465
Subfam.-Tanypodinae	50	45	178	41	44	358
Subfam.-Orthocladiinae	52	85	166	31	19	353
Subfam.-Chironominae	132	131	320	57	114	754
Tribe-Chironomini	96	108	159	41	91	495
Tribe-Tanytarsini	36	23	161	16	23	259
GASTROPODA	2		6	1	2	11
BIVALVIA	54	26	85	17	10	192
TOTAL INDIVIDUALS	366	320	865	194	261	2006

SKIDWAY LAKE OCT 31 1989

TAXONOMIC NAME	SITE					TOTAL
	1 sub	2 sub	3 sub	4 sub	5 sub	
NEMATODA				1		1
OLIGOCHAETA		1	2			2
HIRUDINEA					1	1
ISOPODA		1	1			1
AMPHIPODA	2	2	1	2		2
EPHEMEROPTERA	3	3	3	3	2	3
ODONATA	6	6	5	5	1	8
HEMIPTERA				2		2
MEGALOPTERA		1				1
TRICHOPTERA	6	8	6	7	4	10
COLEOPTERA	1	1		1		3
DIPTERA TOTAL	14	16	20	15	11	26
DIPTERA:Ceratopogonidae	2	2	1	1	1	3
DIPTERA:Chironomidae	12	14	18	14	10	22
Subfam.-Tanypodinae	3	3	6	4	1	6
Subfam.-Orthocladiinae		2	1	1	1	2
Subfam.-Chironominae	9	9	11	9	8	14
Tribe-Chironomini	7	8	10	8	6	11
Tribe-Tanytarsini	2	1	1	1	2	3
DIPTERA:Tabanidae			1			1
BIVALVIA		1	1	1		1
TOTAL GENERA	32	40	39	37	19	61

TAXONOMIC NAME	SITE					TOTAL
	1 sub	2 sub	3 sub	4 sub	5 sub	
NEMATODA				1		1
OLIGOCHAETA		1	2			3
HIRUDINEA					1	1
ISOPODA		2	22			24
AMPHIPODA	5	32	19	53		109
EPHEMEROPTERA	37	111	142	150	4	444
ODONATA	27	74	38	39	1	179
HEMIPTERA				5		5
MEGALOPTERA		2				2
TRICHOPTERA	17	56	21	38	24	156
COLEOPTERA		1		1		2
DIPTERA TOTAL	534	771	1244	1040	861	4451
DIPTERA:Ceratopogonidae	19	63	97	11	79	269
DIPTERA:Chironomidae	515	708	1146	1029	782	4181
Subfam.-Tanypodinae	36	78	161	175	180	630
Subfam.-Orthocladiinae		21	23	41	313	398
Subfam.-Chironominae	479	609	963	813	289	3153
Tribe-Chironomini	454	404	860	731	258	2705
Tribe-Tanytarsini	26	205	103	82	31	448
DIPTERA:Tabanidae			1			1
BIVALVIA		11	7	40		58
TOTAL INDIVIDUALS	620	1061	1495	1367	891	5435

WESTWARD LAKE OCT 30 1989

NUMBER OF GENERA

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
	sub		sub			
TURBELLARIA	1					1
NEMATODA	1	1	1	2	1	2
OLIGOCHAETA	3	4	5	4	3	8
HIRUDINEA				1		1
AMPHIPODA	1	2	2	2	2	2
DECAPODA		1				1
EPHEMEROPTERA	1	3	3	5	3	5
ODONATA	2	1	3		1	4
HEMIPTERA			1			1
MEGALOPTERA			1		1	1
TRICHOPTERA	3		6	6	1	11
LEPIDOPTERA	1				1	1
COLEOPTERA	1		2	2	1	3
DIPTERA TOTAL	17	23	13	30	21	40
DIPTERA:Ceratopogonidae	3	4	3	1	3	4
DIPTERA:Chironomidae	14	19	10	29	18	36
Subfam.-Tanypodinae	2	3	2	4	3	6
Subfam.-Prodiamesinae				1	1	1
Subfam.-Orthocladiinae	3	4		7	5	9
Subfam.-Chironominae	9	12	8	17	9	20
Tribe-Chironomini	5	8	6	13	6	15
Tribe-Tanytarsini	4	4	2	4	3	5
GASTROPODA	1	1			2	2
BIVALVIA	1	1	1	1	1	1
TOTAL GENERA	33	37	38	53	38	84

NUMBER OF INDIVIDUALS

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
	sub		sub			
TURBELLARIA	51					
NEMATODA	40	1	2	2	2	
OLIGOCHAETA	169	7	13	13	14	2
HIRUDINEA				1		
AMPHIPODA	300	21	124	112	63	6
DECAPODA		1				
EPHEMEROPTERA	105	42	240	127	260	7
ODONATA	12	1	5		1	
HEMIPTERA			6			
MEGALOPTERA			6		1	
TRICHOPTERA	8		26	6	1	
LEPIDOPTERA	11				1	
COLEOPTERA	42		11	14	16	
DIPTERA TOTAL	1587	125	1471	237	308	37
DIPTERA:Ceratopogonidae	396	4	6	6	9	4
DIPTERA:Chironomidae	1191	121	1465	231	299	33
Subfam.-Tanypodinae	24	28	104	18	18	1
Subfam.-Prodiamesinae				2	2	
Subfam.-Orthocladiinae	48	12		29	24	1
Subfam.-Chironominae	1119	81	1362	182	255	29
Tribe-Chironomini	417	49	814	101	183	15
Tribe-Tanytarsini	703	32	548	81	72	14
GASTROPODA	9	1			6	
BIVALVIA	460	1	56	20	29	5
TOTAL INDIVIDUALS	2794	200	1960	532	702	61

YOUNG LAKE NOV 6 1989

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
	sub		sub	sub		
TURBELLARIA			1		1	1
NEMATODA	1		2	1	2	2
OLIGOCHAETA	3	2	4	3	4	4
HIRUDINEA	1	1			1	2
AMPHIPODA	2	2	2	2	2	2
DECAPODA		1				1
HYDRACARINA			1			1
EPHEMEROPTERA	7	3	5	4	5	8
ODONATA	4	5	1	3	2	6
MEGALOPTERA			1			1
TRICHOPTERA	7	7	9	8	5	12
LEPIDOPTERA	1	1	1		1	1
COLEOPTERA	5	6	4	2	5	8
DIPTERA TOTAL	13	18	21	16	25	34
DIPTERA:Ceratopogonidae	1	1	3	2	3	3
DIPTERA:Chironomidae	12	17	18	13	21	29
Subfam.-Tanypodinae	3	4	6	4	6	7
Subfam.-Diamesinae					1	1
Subfam.-Orthocladiinae	1	2	2	1	2	4
Subfam.-Chironominae	8	11	10	8	12	17
Tribe-Chironomini	6	9	7	6	9	13
Tribe-Tanytarsini	2	2	3	2	3	4
DIPTERA:Tipulidae				1		1
DIPTERA:Misc.					1	1
GASTROPODA	2	2	4	3	4	6
BIVALVIA	1	1	1	1	1	1
TOTAL GENERA	47	49	57	43	58	90

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
	sub		sub	sub		
TURBELLARIA			6		11	
NEMATODA	1		6	1	2	
OLIGOCHAETA	6	10	34	42	53	1
HIRUDINEA	1	2			1	
AMPHIPODA	505	594	882	833	620	34
DECAPODA		1				
HYDRACARINA			1			
EPHEMEROPTERA	89	17	34	37	93	2
ODONATA	50	36	3	66	45	2
MEGALOPTERA			3			
TRICHOPTERA	17	34	24	38	15	1
LEPIDOPTERA	1	1	4		1	
COLEOPTERA	34	53	71	17	67	2
DIPTERA TOTAL	546	63	550	1198	290	26
DIPTERA:Ceratopogonidae	6	2	40	21	35	1
DIPTERA:Chironomidae	540	61	510	1176	254	25
Subfam.-Tanypodinae	88	32	291	306	150	8
Subfam.-Diamesinae					1	
Subfam.-Orthocladiinae	6	2	77	71	30	1
Subfam.-Chironominae	445	27	143	800	73	14
Tribe-Chironomini	249	23	92	118	40	5
Tribe-Tanytarsini	196	4	51	682	33	9
DIPTERA:Tipulidae				1		
DIPTERA:Misc.					1	
GASTROPODA	25	25	12	62	32	1
BIVALVIA	3	5	6	18	24	
TOTAL INDIVIDUALS	1278	841	1636	2312	1254	73

APPENDIX 7

SPATIAL AND TEMPORAL VARIANCE COMPONENTS FOR THE MAJOR TAXONOMIC GROUPS IN EACH

1. Turbellaria
2. Nematoda
3. Oligochaeta
4. Hirudinae
5. Amphipoda
6. Ephemeroptera
7. Odonata
8. Hemiptera
9. Megaloptera
10. Trichoptera
11. Lepidoptera
12. Coleoptera
13. Diptera: Total
14. Diptera: Ceratopogonidae
15. : Chironomidae
16. : Subfam. Tanypodinae
17. : Subfam. Orthocladiinae
18. : Subfam. Chironominae
19. : Tribe - Chironomini
20. : Tribe - Tanytarsini
21. Diptera: Tabanidae
22. Diptera: Tipulidae
23. Gastropoda
24. Bivalvia

FALL 1988-89 VARIANCE COMPONENTS COMPARISON (LOG DATA)

	BLUE CHALK					CLEAR					CRADLE				
	TOTAL	TEMPORAL	SPATIAL	%Date	%Site	TOTAL	TEMPORAL	SPATIAL	%Date	%Site	TOTAL	TEMPORAL	SPATIAL	%Date	%Site
TURBELLARIA	55.5	11.1	44.5	20	80										
NEMATODA	79.5	0.2	79.3		100	59.7	3.2	56.6	5	95	100.0		100.0		100
OLIGOCHAETA	66.8	20.0	46.8	30	70	49.9	5.3	44.6	11	89	61.2	20.0	41.2	33	67
HIRUDINAE	39.4	1.2	38.2	3	97	69.0	2.3	66.7	3	97	77.4	0.7	76.7	1	99
ISOPODA															
AMPHIPODA	59.7	0.5	59.2		99	61.7	18.3	43.4	30	70	61.7	18.3	43.4	30	70
DECAPODA	55.6	11.1	44.4	20	80						62.5	25.0	37.5	40	60
HYDRACARINA											61.0	22.0	39.0	36	64
EPHEMEROPTERA	55.6	34.3	21.3	62	38	56.0	2.2	53.9	4	96	80.0	41.3	38.7	52	48
ODONATA	69.2	0.2	69.0		100	53.0	10.9	42.1	21	79	65.9	0.1	65.8		100
PLECOPTERA	37.5		37.5		100										
HEMIPTERA	55.6	11.1	44.4	20	80	55.6	11.1	44.4	20	80	74.2	58.8	15.4	79	21
MEGALOPTERA						76.9	0.6	76.3	1	99	100.0		100.0		100
TRICHOPTERA	50.2	0.4	49.8		99	76.2	45.0	31.1	59	41	50.0	3.6	46.4	7	93
LEPIDOPTERA	55.6	11.1	44.4	20	80	41.5	2.4	39.0	6	94	55.6	11.1	44.4	20	80
COLEOPTERA	65.4		65.4		100	79.8		79.8		100	79.8		79.8		100
DIPTERA:Total	51.3	1.4	50.0	3	97	39.4	6.5	33.0	16	84	80.2	24.4	55.8	30	70
DIPTERA:Ceratopogonidae	38.7	11.4	27.3	29	71	61.1	14.1	47.0	23	77	64.5	14.0	50.5	22	78
:Chironomidae	50.1	0.7	49.4	1	99	42.4	5.8	36.6	14	86	81.5	25.7	55.8	32	68
:Subfam.Tanypodinae	52.7	0.5	52.2	1	99	14.0	1.0	13.0	7	93	79.3	36.7	42.6	46	54
:Subfam.Diamesinae															
:Subfam.Prodiamesinae	55.5	11.1	44.5	20	80	77.9	15.2	62.7	20	80	55.6	11.1	44.4	20	80
:Subfam.Orthocladiinae	79.4	26.2	53.2	33	67	23.1	2.0	21.2	9	91	84.0	21.6	62.4	26	74
:Subfam.Chironominae	35.5	1.0	34.5	3	97	51.8	9.7	42.1	19	81	82.2	14.1	68.1	17	83
: Tribe-Chironomini	40.9	27.6	13.3	67	33	38.8	7.1	31.7	18	82	71.4	8.3	63.0	12	88
: Tribe-Tanytarsini	80.5	7.1	73.4	9	91	79.0	1.4	77.6	2	98	76.3	15.2	61.1	20	80
DIPTERA:Tabanidae															
DIPTERA:Tipulidae	55.6	11.1	44.5	20	80	37.5		37.5		100					
:Misc.	92.2		92.2		100	33.3	4.8	28.6	14	86					
GASTROPODA	58.4		58.4		100	44.4	11.5	32.9	26	74	61.7	23.5	38.3	38	62
BIVALVIA	81.2	19.6	61.6	24	76	53.2	16.7	36.4	31	69	69.4	9.4	60.0	13	87

FALL 1988-89 VARIANCE COMPONENTS COMPARISON (LOG DATA)

	CROSSON					DELANO					HAMER				
	TOTAL	TEMPORAL	SPATIAL	%Date	%Site	TOTAL	TEMPORAL	SPATIAL	%Date	%Site	TOTAL	TEMPORAL	SPATIAL	%Date	%Site
TURBELLARIA	85.3	19.6	65.7	23	77						55.6	11.1	44.4	20	80
NEMATODA	86.0	45.1	40.9	52	48	37.9	7.8	30.1	21	79	55.6	11.1	44.4	20	80
OLIGOCHAETA	92.6	22.3	70.3	24	76	44.7	4.0	40.7	9	91	92.5	55.2	37.3	60	40
HIRUDINAE	42.7	10.9	31.8	25	75	41.6	4.2	37.4	10	90	33.3	4.8	28.6	14	86
ISOPODA															
AMPHIPODA	63.9	18.7	45.3	29	71	91.3	0.3	91.0		100	60.4	14.6	45.8	24	76
DECAPODA															
HYDRACARINA	76.0	53.8	22.2	71	29	61.0	22.0	39.0	36	64	74.9	40.3	34.5	54	46
EPHEMEROPTERA	83.7	0.1	83.6		100	60.4	3.3	57.1	5	95	65.6	1.9	63.8	3	97
ODONATA	51.1	27.1	24.0	53	47						49.3	6.3	43.0	13	87
PLECOPTERA															
HEMIPTERA	37.5		37.5		100	37.9	7.8	30.1	21	79	58.3	16.6	41.7	29	71
MEGALOPTERA	90.8		90.8		100	55.6	11.1	44.4	20	80	64.2	10.9	53.3	17	83
TRICHOPTERA	12.9	3.3	9.6	25	75	68.8	35.4	33.4	51	49	69.7	2.4	67.4	3	97
LEPIDOPTERA											55.6	11.1	44.4	20	80
COLEOPTERA	90.2	23.9	66.3	27	73	97.6	34.4	63.1	35	65	73.5	23.2	50.3	32	68
DIPTERA:Total	80.9	32.4	48.5	40	60	92.8	44.1	48.7	48	52	46.0	21.2	24.9	46	54
DIPTERA:Ceratopogonidae	67.7	21.9	45.8	32	68	81.6	17.5	64.2	21	79	15.3	6.8	8.5	45	55
:Chironomidae	80.9	32.6	48.3	40	60	93.1	44.8	48.3	48	52	63.3	21.8	41.6	34	66
:Subfam.Tanypodinae	55.4	16.0	39.4	29	71	92.0	23.0	69.0	25	75	70.4	3.0	67.4	4	96
:Subfam.Diamesinae											70.3	40.6	29.7	58	42
:Subfam.Prodiamesinae															
:Subfam.Orthocladiinae	74.6	33.4	41.2	45	55	96.2	34.5	61.6	36	64	64.2	6.8	57.5	11	89
:Subfam.Chironominae	90.4	43.8	46.5	49	51	92.1	55.1	37.0	60	40	57.6	42.2	15.4	73	27
: Tribe-Chironomini	82.1	41.2	40.9	50	50	88.7	40.8	47.9	46	54	58.3	42.6	15.7	73	27
: Tribe-Tanytarsini	91.4	33.4	58.0	37	63	93.6	69.7	23.9	75	25	61.3	12.8	48.5	21	79
DIPTERA:Tabanidae	55.6	11.1	44.4	20	80	62.5	25.0	37.5	40	60	39.5	1.2	38.3	3	97
DIPTERA:Tipulidae	55.6	11.1	44.4	20	80	55.6	11.1	44.4	20	80	55.6	11.1	44.4	20	80
:Misc.											55.6	11.1	44.4	20	80
GASTROPODA	81.4	9.8	71.7	12	88	93.5	91.2	2.2	98	2	72.2	2.1	70.1	3	97
BIVALVIA	89.7	43.8	45.9	49	51	88.2	4.8	83.4	5	95	48.0	20.3	27.8	42	58

FALL 1988-89 VARIANCE COMPONENTS COMPARISON (LOG DATA)

	HARP					PINCHER					PLASTIC				
	TOTAL	TEMPORAL	SPATIAL	%Date	%Site	TOTAL	TEMPORA	SPATIAL	%Date	%Site	TOTAL	TEMPORA	SPATIAL	%Date	%Site
TURBELLARIA	54.6	6.6	48.0	12	88						62.5	25.0	37.5	40	60
NEMATODA	67.2	34.5	32.8	51	49	55.6	11.1	44.4	20	80	33.3	16.7	16.7	50	50
OLIGOCHAETA	67.9	12.2	55.6	18	82	74.5	45.8	28.7	61	39	32.0	13.3	18.7	42	58
HIRUDINAE	37.9	7.8	30.1	21	79	68.6	41.7	26.9	61	39	84.2	19.3	64.9	23	77
ISOPODA															
AMPHIPODA	93.2	44.2	49.0	47	53	86.8	24.2	62.6	28	72	69.4	3.0	66.5	4	96
DECAPODA															
HYDRACARINA	76.0	52.0	24.0	68	32						62.5	25.0	37.5	40	60
EPHEMEROPTERA	75.2	19.8	55.4	26	74	72.8	32.8	40.1	45	55	87.1	72.0	15.0	83	17
ODONATA	79.2	28.6	50.6	36	64	97.7	89.3	8.3	91	9	70.0	49.2	20.8	70	30
PLECOPTERA	55.6	11.1	44.4	20	80										
HEMIPTERA	55.6	11.1	44.4	20	80	92.4	82.1	10.3	89	11					
MEGALOPTERA	61.7	23.5	38.3	38	62	55.6	11.1	44.4	20	80					
TRICHOPTERA	53.4	13.1	40.3	25	75	90.0	71.5	18.5	79	21	69.1	46.0	23.2	66	34
LEPIDOPTERA	81.0	4.8	76.2	6	94	55.6	11.1	44.4	20	80	55.6	11.1	44.4	20	80
COLEOPTERA	95.4	20.4	75.0	21	79	61.4	45.3	16.0	74	26	55.6	11.1	44.4	20	80
DIPTERA:Total	82.5	3.5	79.0	4	96	95.4	74.0	21.4	78	22	67.8	23.9	43.8	35	65
DIPTERA:Ceratopogonidae	87.3	26.4	60.9	30	70	72.4	47.2	25.2	65	35	59.6	1.5	58.1	2	98
:Chironomidae	81.1	2.4	78.7	3	97	94.6	73.1	21.5	77	23	67.8	24.9	42.9	37	63
:Subfam.Tanypodinae	82.7	33.2	49.5	40	60	83.6	19.5	64.2	23	77	70.1	23.2	46.9	33	67
:Subfam.Diamesinae															
:Subfam.Prodiamesinae	67.5	4.6	62.9	7	93										
:Subfam.Orthocladiinae	87.4	7.0	80.4	8	92	95.6	62.5	33.0	65	35	14.6	4.0	10.5	28	72
:Subfam.Chironominae	76.6	21.2	55.4	28	72	92.6	76.0	16.6	82	18	79.5	29.3	50.2	37	63
: Tribe-Chironomini	82.4	14.9	67.5	18	82	76.6	66.3	10.3	87	13	90.4	34.9	55.5	39	61
: Tribe-Tanytarsini	77.9	25.3	52.6	32	68	73.8	54.3	19.5	74	26	58.2	7.8	50.4	13	87
DIPTERA:Tabanidae	55.6	11.1	44.4	20	80	85.3	19.6	65.7	23	77					
DIPTERA:Tipulidae	55.6	11.1	44.4	20	80						61.7	23.5	38.3	38	62
:Misc.						55.6	11.1	44.4	20	80	55.6	11.1	44.4	20	80
GASTROPODA	94.5	6.3	88.2	7	93	40.9	7.4	33.5	18	82	85.3	5.4	79.9	6	94
BIVALVIA	67.7	5.7	62.0	8	92	68.6	0.1	68.5		100	89.0	2.9	86.1	3	97

FALL 1988-89 VARIANCE COMPONENTS COMPARISON (LOG DATA)

	SKIDWAY					WESTWARD					YOUNG				
	TOTAL	TEMPORAL	SPATIAL	%Date	%Site	TOTAL	TEMPORAL	SPATIAL	%Date	%Site	TOTAL	TEMPORAL	SPATIAL	%Date	%Site
TURBELLARIA						53.9	0.9	53.0	2	98	62.3	24.5	37.7	39	61
NEMATODA	55.6	11.1	44.4	20	80	80.2	37.7	42.5	47	53	77.5	13.4	64.0	17	83
OLIGOCHAETA	53.2	8.7	44.5	16	84	86.5	2.3	84.2	3	97	90.0	58.4	31.6	65	35
HIRUDINAE	55.6	11.1	44.4	20	80	69.7	52.5	17.2	75	25	35.3	1.6	33.7	5	95
ISOPODA	75.6	18.3	57.3	24	76										
AMPHIPODA	82.7	33.7	49.0	41	59	53.7	12.1	41.7	22	78	72.4	36.2	36.2	50	50
DECAPODA						55.6	11.1	44.4	20	80	37.5		37.5		100
HYDRACARINA	80.8	61.6	19.2	76	24						100.0		100.0		100
EPHEMEROPTERA	58.7	44.2	14.5	75	25	47.2	17.9	29.3	38	62	84.4	28.5	55.9	34	66
ODONATA	63.3	14.8	48.5	23	77	53.7	0.8	52.9	1	99	69.7	23.2	46.5	33	67
PLECOPTERA						55.6	11.1	44.4	20	80	55.6	11.1	44.4	20	80
HEMIPTERA	70.9	36.4	34.5	51	49	25.1	5.3	19.8	21	79					
MEGALOPTERA	78.9	44.1	34.7	56	44	82.2	10.4	71.8	13	87	41.5	2.4	39.0	6	94
TRICHOPTERA	90.1	80.0	10.1	89	11	61.0	0.1	61.0		100	73.6	46.2	27.4	63	37
LEPIDOPTERA	61.0	22.0	39.0	36	64	74.5	3.3	71.3	4	96	93.9	22.8	71.1	24	76
COLEOPTERA	63.9	50.2	13.7	79	21	62.0	14.5	47.5	23	77	88.2	83.0	5.2	94	6
DIPTERA:Total	60.6	21.7	38.9	36	64	71.3	19.6	51.8	27	73	78.6	35.0	43.5	45	55
DIPTERA:Ceratopogonidae	41.4	15.3	26.1	37	63	60.2	2.8	57.4	5	95	63.6	34.3	29.3	54	46
:Chironomidae	57.9	17.9	39.9	31	69	73.0	22.7	50.4	31	69	79.4	34.2	45.2	43	57
:Subfam.Tanypodinae	65.6	27.9	37.7	42	58	80.6	5.0	75.7	6	94	66.2	25.8	40.4	39	61
:Subfam.Diamesinae											37.9	7.8	30.1	21	79
:Subfam.Prodiamesinae						48.6	1.8	46.8	4	96	61.7	23.5	38.3	38	62
:Subfam.Orthocladiinae	62.4	24.4	38.0	39	61	35.7	7.4	28.3	21	79	86.0	61.2	24.8	71	29
:Subfam.Chironominae	21.4	9.8	11.6	46	54	72.2	26.2	46.0	36	64	81.4	28.5	53.0	35	65
: Tribe-Chironomini	30.7	16.4	14.2	54	46	71.0	32.0	39.0	45	55	70.9	19.3	51.7	27	73
: Tribe-Tanytarsini	25.4	9.0	16.5	35	65	68.4	20.5	47.9	30	70	86.3	37.9	48.3	44	56
DIPTERA:Tabanidae	37.5		37.5		100						55.6	11.1	44.4	20	80
DIPTERA:Tipulidae	55.6	11.1	44.4	20	80						95.2	1.2	94.0	1	99
:Misc.	62.5	25.0	37.5	40	60	61.7	23.3	38.3	38	62	55.6	11.1	44.4	20	80
GASTROPODA						63.3	5.5	57.8	9	91	34.4	19.7	14.8	57	43
BIVALVIA	84.7	19.0	65.6	22	78	59.1	5.1	54.0	9	91	30.3	4.4	25.9	15	85

APPENDIX 8

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